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Fish Caught	Hook	Bait
Eve, uuliki, taino	Yeki or tope	Kaloma, ie, or crab
Ulouka	Tope or small composite hook	Crab or kaloma
Parrot fish	Yeki	Tridacna, crab, or seaweed
Pakova, geva, lai, and laiwuta	Tope or composite hook	Dead kaloma
Une, paiongi, malava, kayaye, ma, and maito	Yeki	Crab, kaloma, or Tridacna
Malali and laiavi	Tope	Unga and kaloma
Malatea and eels	Wooden hooks	Tridacna, octopus, or sea urchin (vana)
Wauhaia, laiuua, tiwitiwi, taiatae, iauuuui, yama, tiiaeyama, taiva, koikii, kili, aaeaenga, yiuua, atafa, rock groupers, waqiliki, and pakava	Plain or barbed tope	Crab or kaloma (grouper papa best caught with bait of flying fish or octopus)
Sharks (occasionally when trawling albacore fishing; not eaten)	Large wooden hooks	Any dead bait

The method of attaching dead bait (*maaua maate*) to any type of single-piece fishhook is shown in figure 4, *a*. Live bait used in *lulu* fishing is any small fish. The point of the hook is passed through the back of the fish or the fish is tied to the hook shank by the bait string (*tahele maaua*) so that it wriggles about in the water. *Kaloma* bait is preferred in *lulu* fishing for the fish also caught by the *tauala* system, except for *aloa* and *lai*, which bite best with live *malolo* bait on a wooden hook. *Kowuli* is fished only at night with a composite hook. *Lai* is fished only at night in the full and new moon, with *tojo* hook. For *lulu* fishing the bait is caught before the planned expedition and kept alive in a submerged basket tied to the cross booms at the side of the canoe, within easy reach of the fisherman. The mouth of the basket is securely fastened to prevent the escape of the bait fish.

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A special method of attaching sinker to line is employed in *lulu* fishing for *kahai* and *pala* fish:

The hook (*mahaolo*) is barbed. A secondary snood (*mautai*) of two- or three-ply twisted cane fiber about 7 feet long joins the hook to the fishline of sennit. Unlike sennit which hardens in water, *vaso* line becomes soft and slips easily from the sinker when jerked. Live bait of *kaloma* or *atule* is fastened by the tail to the shank of the hook. Hook and bait are laid on the surface of a smooth coral stone sinker, and chum placed on top is covered by a *puapua* leaf so that it will not scatter until the requisite depth is reached. The *mautai* snood is passed around the sinker away from the barb of the hook, making two or three transverse turns to secure both hook and bait. The *mautai* is then caught in a bight with the left hand and passed around the sinker once in the opposite direction, passing over the right thumb that holds the first transverse turns in place. The bight and the running part of the *mautai* are tied together in a single overhand knot; sometimes a single slip noose is made on top of this overhand knot. Hook and sinker are paid out until the required depth is reached, when a sharp jerk on the line releases the sinker which falls away, leaving the hook, bait, and chum at a favorable depth.

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Many men go outside the reef two or three times each week to catch *kahai*, the fish usually caught in fishing competitions. *Kahai* fishing is the favorite deep-sea fishing of the Pukapukans today:

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A man catches his *kalowa* bait in the morning. Besides his fishing gear and two or three coconuts for his day's lunch, he takes with him coconut-leaf mats (*pola launu*) which provide protection from sun and rain and serve as sails. A mat leaning against the fisherman's back while he waits for a bite is easily thrown aside when strenuous activity is required to haul up the fish on the line before the sharks can take the fish from the hook. When the canoe is kedged to the reef and there is only a gentle breeze blowing offshore, a mat sail is used to prevent drifting onto the reef, thus obviating the necessity of paddling out from the reef again and again. A big sail in a fishing canoe would be cumbersome and would catch too much wind. A mat standing up in the canoe, with vertical midrib base and light guys running to outrigger booms providing support, gives sufficient belly to catch the wind and keep the canoe off the reef without dragging anchor.

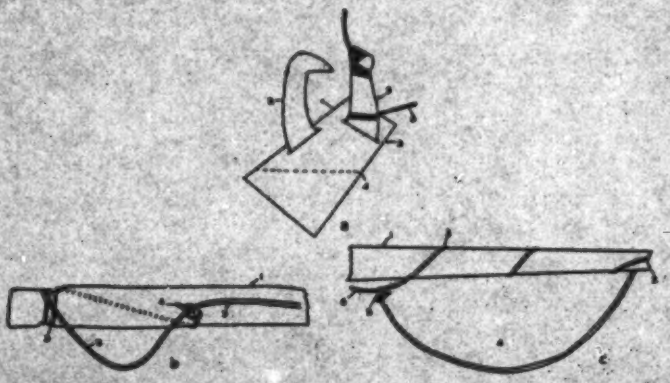

FIGURE 4.—Implements for fishing and bird nooosing. *a*, fishhook with bait attached: any dead fish bait (*moana mate*) is attached to old style hook by removing head from bait fish and stripping off fillet (1), excluding backbone from belly backward so that flesh remains whole; hook (2) thrust through tail end (3) of fillet from flesh side, back through head end of fillet from skin side; fillet folded (4) along hook (dotted line), flesh side outward, skin side inward, and tail end of fillet lashed to shank (5) of hook, near shank knob, by transverse turns of bait string (6), fastened with half hitches. *b*, bird noose (*pola moana*): pole (1) about 12 feet long, 2 inches in diameter; noose (2) two-ply twisted sennit; one end of sennit passed transversely around notch end of pole (3), then down underneath two transverse turns; short free end (4) tied in square knot on bight; running end (5) passes down pole to bird catcher's hands at proximal end. *c*, fish noose (*kauyala*) (CB152): wooden support (1) of *puapua* wood about 6 feet long, ¼ inch in diameter at proximal end, ¾ inch in diameter at distal end which is notched (2); noose cord (3) of strong, three-ply twisted sinn, wound around support, passed over notch (2) to form noose (4); free end knotted on bight (5) and cord (6) passes to proximal end of support.

Tuku moana fishing from a stationary canoe outside the reef with dead bait differs in two respects from both *tuku* and *tauala* fishing: *tuku moana* fishing is deep-sea hand-line fishing up to about 300 fathoms and involves

1:Beaglehole and Beaglehole E-5 (1934-5)1938 Pukapukans

the use of a special composite fishing apparatus (*taumakomako*) consisting of four or more hooks fixed by spreaders to a single line. Two types of *taumakomako* are described elsewhere (p. 188). The hooks of both types are baited with dead *mulolo* or other dead bait.

The *taumakomako* is lowered over the side of the canoe and line paid out until it is felt that the sinker has touched bottom; it is then heaved up a few feet. When the first fish is felt, the line is hauled in a little. This is repeated until all hooks have caught fish, when the whole apparatus is pulled to the surface. A strong fisherman is required to pull up the apparatus, weighted down with fish, from a depth of 200 fathoms to the surface with sufficient speed to avoid losing the fish to sharks. I did not see a *taumakomako* in use; it is said to be used occasionally by expert fishermen. The deep water fish caught by the *tuku moana* method are: *palu moana, palu uutu, palu atu, palu pauloi, palu motapula, palu malau, palu uea, palu tavatava, palu alua, palu homuli, palu kahai,* and *palu katakata*. The giant *kahai* (*Ruvettus*), which is so large that no fish-line is strong enough to hold it, is always noosed. An account of *tuku moana* fishing with a detailed explanation of the hooking and pulling in of fish is given in the story of Maui (1).

RUVETTUS FISHING

The method of fishing for *Ruvettus* (*palu kilitala* or *palu taeyi*) with a wooden hook (*kau*) is termed *yi palu*. It has been practiced in Pukapuka from very early times. An ancestor, Yaki, is remembered as the man who first fished *Ruvettus*.

The hook is attached to the line of sennit by the secondary snood (*watai*) with an ordinary double overhand knot. The sennit line may be 300 fathoms long, though the usual fishing depth is about 200 fathoms. Two methods are adopted for attaching the sinker (*watu yi palu*) to the wooden hook. In the first method the sinker line, a strip of pandanus leaf (*uwo tua hir* or *uwo lauulu*), is fastened to the sinker by a simple slip noose and to the head of the wooden hook by a similar slip noose (overhand knot on a standing line). When the fish worries at the bait it bites through or snaps the frail pandanus, and the sinker falls away from the hook. In the second method the sinker line of pandanus is fastened to the sinker by a simple slip noose, but the free end of the sinker line is laid on the bend of the hook, and two turns of the line are taken around the bend of the hook and over the free end. When the sinker touches the bottom, the bottom takes the weight of the sinker, the two turns around the hook loosen, and the sinker falls free. The second method is used only by the expert. The non-expert, unable to judge accurately by touch when the sinker has touched the bottom, would pay out too much line, foul his hook on the bottom, and lose it.

Special bait attachment is used for the wooden hook. A fillet of *mulolo* fish is laid on the point limb of the hook and tied halfway down the point limb with several transverse turns and an overhand knot. The remaining part of the fillet is laid back along the point limb so that it covers part of the functional point. The fastening of fillet to limb is with a strip of coconut midrib fiber (*kaiuu*). This is used in preference to the ordinary bait string (*takele moana*) of *uwo* cord, because the sharp teeth of the *Ruvettus*, which can bite through the *uwo* and destroy the *takele moana*, are not sharp enough to destroy tough coconut fiber. The lashing of the point of the wooden hook to the point limb is protected from the teeth of the *Ruvettus* by a covering of sharkskin wrapped over the lashing and tied above and below with coconut midrib fiber. The bait fillet is fastened to the hook on top of the sharkskin protective wrapping. No chum is used for *Ruvettus*.

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MOOSING

226 254 Moosing (*yale*) is a common Pukapukan method for catching eels, sharks, swordfish, *matawale hakai*, and *pale*. No bait stick, whole fish bait, or special type of noose is used for the eels in Pukapuka, nor are sea centipedes or crayfish caught by this method, as is reported for Samoa (27, p. 421). The Pukapukan noose of three-ply twisted cord of *uso* fiber is made by passing a free end of the cord around the running section of cord and tying it around itself with an overhand knot. The noose is made about 3 feet in diameter. (See p. 188). Fishing is outside the reef:

A teaser bait (*pakupaku*) of bonito flesh is tied to a line and trolled behind the canoe to attract the fish. As the canoe trolls the teaser, the crew make their paddles resound (*tangi*) by hitting the water and beating the sides of the canoe with them. When the fish is seen, the teaser is pulled into the canoe, the noose placed on the *kauyale* stick, and the stick put into the water. Chum is thrown out to attract the fish toward the noose. The stick is withdrawn and more chum thrown into the water on the farther side of the noose. The noose is thus between two chums and is maneuvered so that even a wary (*kailepe*) fish comes up on the starboard side of the canoe. When the fish moves through the noose to reach the second chum, the noose is pulled tight around its tail. The fish is hauled to the canoe and clubbed before being lifted in. This method of mooring fish corresponds to similar methods described for Samoa (27, p. 421) and Vaitupu (19, pp. 56-60). In Pukapuka however there is nothing corresponding to the hurling of insulting remarks (*tapatapa*) to the fish to make them indiscreet, as Kennedy reports for Vaitupu.

TURTLES

225 Three varieties of turtle are common in Pukapukan waters: *matawae*, the largest green turtle; *wonu*, the ordinary green turtle; and *wonu kea*, the hawk's-bill turtle. When turtles are sighted from the shore, the news is called out through the village and the people ask, "E talau? E taepu?" (Is it big? Is it small?). There are three methods by which turtles may be captured:

1. *Puke wonu*, overtaking or seizing a turtle. A man swims out to sea in the season for turtles. He may swim several miles before he sights the animal. Coming up to a turtle, he gets on its back and gouges out its eyes with his thumbs, at the same time forcing the head of the animal upwards with hand pressure. As long as this pressure is continued, the turtle will keep to the surface and will not sound. Alternately the fisherman catches the foreflippers of the turtle with his arms and holds them up; this also prevents the turtle from sounding. If the fisherman is expert, he steers the turtle over the reef to the beach; otherwise he holds the animal until a canoe arrives from shore. An expert who is a good swimmer, strong and skillful, can bring a turtle ashore unaided. When turtles to be caught by this method are seen from a canoe, the first command is for absolute silence, for the turtle sounds immediately noise is heard. One of the crew slips into the water, swims up to the animal, and grips it as just described. His companions stretch apart the foreflippers, tie them to a stout stick, and lift the animal into the canoe.

2. *Yale wonu*, mooring. A man swims out to sea, often with a canoe outrigger as a float, while he waits to sight a turtle. When he sees one, he takes a line with a running noose in the end and dives and slips the noose over the foreflipper. The noose is pulled

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223 His partner catches the birds on the ground and kills them.- Birds caught thus are *uli*, *tulli*, *manu uli*, *tavake toto*, and *tavake mokomoko*.

Catching birds by throwing stones or sticks is common. The catcher goes to the beaches armed with throwing stones of coral, or with a number of short, heavy sticks about 2 feet long. He comes near the feeding or nesting places of the birds and attempts to kill them by throwing (*hamu*) his missiles. This method is used for *tulli*, *manu uli*, *tavake toto*, *tavake mokomoko*, *kaleva*, *lupe*, and *matiku*.

4. Lure used for the tropic birds.

The catcher collects a handful of the young white leaves of the pandanus tree. He goes to the place where the birds are resting or feeding and waves the leaves in the air (*wahaiteiku*), at the same time uttering a guttural cry, "I ka! i ka!" The waving of the lure and the cry attract the birds which come fluttering overhead. They are then netted, knocked down, or caught in the hands of the netter or his assistant.

5. Noosing and snaring.

A noose (*yale manu*, fig. 4*b*) of the required size is attached to a pole which is thrust out along the branches to the place where the bird is nesting. The noose is placed over the neck of the roosting bird and pulled tight, strangling the bird. Then the pole is pulled in while the bird is disengaged and thrown to earth. The pole noose is reset and pushed out again for the next bird. This technique is used for *kotawa*, *noe*, *tukuafa*, *ngongo*, *lakia*, *koka*, *akiaki*, *tulli*, *manu uli*, and *tavake mokomoko*.

[284] A variant method is to use the noose without the pole. The noose (again called *yale manu*) is made with a square knot on a bight and held in the hand. The catcher crawls up to the bird nesting in the sand and drops the noose over the bird's neck, pulls it tight, and strangles the bird. Noosing by this method is used principally for *koka*.

Two methods of snaring birds also involve the use of the noose principle. The bird snare (*mauanga*) is described in figure 4*d,b*. A piece of beach is chosen which the birds are in the habit of frequenting. The *mauanga* is placed on the ground and firmly anchored by a sennit cord passing from one end of the snare pole to a large coral stone near by. The catcher gets behind a group of birds and gently drives them in the direction of the snare. Whenever the birds stop moving, the catcher stops; when they move again, he directs them toward the nooses. The birds hop along, come to the *mauanga*, which they are unable to avoid owing to the projecting wings, advance through the nooses, and are caught by the feet. The catcher comes up to kill them. Birds so caught are *kaue*, *tuli*, *kolili*, *polopolounga*, *kio*, *talaloka*, and *tuiko*.

A second type of snare is the coconut-shell *mauanga ngaipu* (fig. 4*d,a*). Five or six of these are set up on a suitable beach and coconut flesh is strewn about the ground. The bird is attracted by the coconut, inserts its head into the nut to peck at the flesh and entangles its feathers in the sennit fiber nooses. The bird struggles to escape, usually overturning the coconut which falls on top of it. The bird is removed and the snare reset. This snare is used for *tuli*, *kolili*, *polopolounga*, *kio*, *talaloka*, and *tuiko*.

6. Line catching. Birds are also caught by a method involving the use of fishline. One variant of this method is used for birds (*talaiuu* and *tala*) that skim the water close to shore looking for small fish food.

To the end of a small fishline a gorge (*au*) of fishbone is fastened. *Kaloma* bait is tied to the gorge and the line is laid along the beach at water's edge. The birds come down for the bait, the gorge sticks in their throats, and they are firmly caught. A second variation of this method, called *tavakalo manu*, is used for birds that hop about feeding in the shallows and wet beaches. A piece of the abdomen of the hermit

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The operator procures a piece of *puapua* wood from which the bark has been removed. This wood is about 4 feet long and 1 inch in diameter and has numerous grooves on it from previous use. The operator splits the end of the stick and cuts off a section to use as a rubbing stick 9 inches long, ¾ inch thick at the proximal end (*mulimuli*), and about ⅝ inch thick at the distal end (*mato*). The distal end is shaped to a mesial point by a transverse cut with a knife. A few slices of wood are also taken off the hearth stick to form a flat surface to rub on. The point of a knife, formerly a sharp pointed shell, is pressed into the distal end of this flat surface to form a hole which serves as a blockage point for the farthest distal movement of the rubbing stick. An assistant crouching over the stick firmly holds the distal end of the hearth stick (*yoliyoli te lakau*) with foot and hand. The operator sits on the floor and locks one leg over the hearth. He holds the rubbing stick so that the crossed thumbs are placed beneath the stick; the flexed fingers of the right hand are placed over the stick and on them are laid the flexed fingers of the other hand. The grip is close to the distal end of the stick, 3⅝ inches from the point. He crouches over the stick, leaning the whole weight of his body on it while moving the stick to and fro at an angle of 45 degrees to the hearth. The groove is about 3 inches long. The operator rubs slowly at first, increasing the speed of the rubbing as the dust collects and begins to smoke. When the dust smoulders he cries, "Na tu" (It burns). The smouldering dust is carefully tipped onto a dry coconut husk and fanned or blown until the husk blazes. Some fire-makers prefer a very short rubbing stick and hold it close to the end so as to exert maximum pressure on the stick. An informant, holding his stick 3½ inches from the point, produced fire only on a second attempt.

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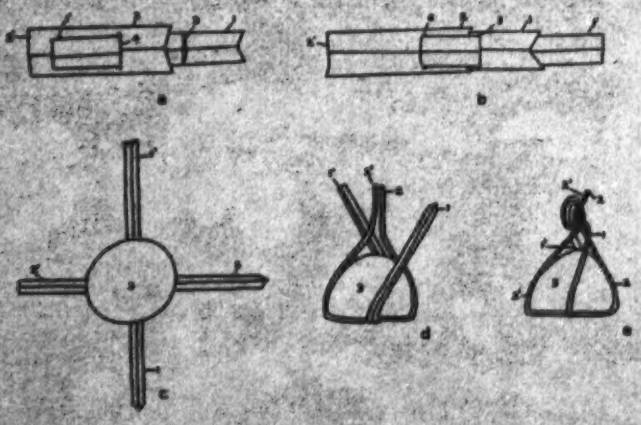

FIGURE 6.—Food packages: *a–b*, *lulu* food package; *c–e*, *talo* (*lolei*) food package. *a*, leaflet midribs stripped from butt ends of two coconut leaflets (1, 1′ and 2, 2′), slits (3, 4) made with thumb nail in butt ends of the leaflets, tip end of leaflet (1′) passed through slit (4) in leaflet (2); *b*, tip end of leaflet (1′) folded back, passed through slit (3) in butt end of leaflet (1) and pulled tight, length of joined leaflet placed under food package, two ends make transverse turns around package and tie with overhand knots. *c*, two coconut leaflets (1, 1′ and 2, 2′) crossed and food package (3) placed on crossing; *d*, leaflet ends (2, 2′) brought together and held with one hand; *e*, leaflet ends (1, 1′) twisted around ends (2, 2′); then ends (2, 2′) bent down over transverse turns, pushed up under transverse ends, and pulled tight.

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side beam) from the end curve purlin (which is itself lashed at each end to the side curve purlins) to the end side rafters. Four end rafters run to the left side rafter, four to the right side rafter. The end rafters are of varying length depending on their distance from the highest point of the ridgepole. Another end purlin, midway between curve purlin and ridgepole supports the end rafters on the inside. A variation may sometimes be introduced into the gable end of both the *unkuyamoa* and the *wale atua* house types, by using for the end purlin a piece of timber that has a slight, natural curve in the horizontal plane. The end rafters would be made of suitable length to retain the natural curve of the purlin. In small houses of the *unkuyamoa* type, where the end purlin was of small diameter, it was sometimes bent into an artificial curve through binding the two ends of the purlin to the ends of the two outermost side principal rafters and through graduating the length of the end rafters in such a way that when lashed to the purlin, they thrust it out in a slight horizontal curve. There are no side or end thatch rafters on the type house. The coconut roof sheets are fastened directly to the principal rafters, the midribs of the sheets functioning as thatch rafters.

Lashing

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The lashing used for all parts of the house framework is of one pattern only, that of alternating curves, termed *yinu unkuvivi*. The lashing corresponds to the curved pattern lashing described by Buck (29, p. 72, fig. 5)

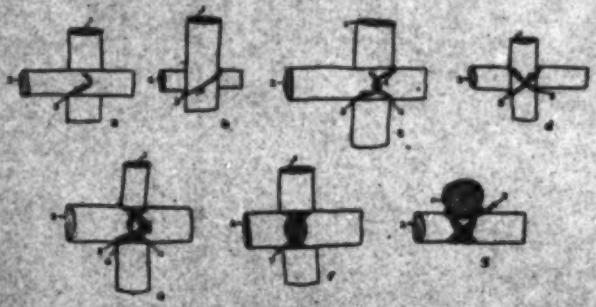

FIGURE 9.—Alternating curves lashing, used for principal parts of house framework; lashing shown for fastening together tiebeam (1) and wall plate (2). *a*, view from above: sennit braid laid on wall plate and held with thumb; free end makes curved turn on under side of wall plate (3). *b*, view from below: free end makes transverse turn across tiebeam. *c*, view from above: sennit braid (4) brought across commencement end, thumb holds crossing cords in place while braid makes curved turn across and down at wall plate (4). *d*, view from below: braid (5) makes transverse turn across and up tiebeam to curve around wall plate. *e*, view from above: braid (6) curves to right across second curve (4) and locks preceding two curves in place; thumb then removed and rough sennit does not slip. *f*, view from above: repetition of two curved turns successively applied on same side of previous turns produces pattern (9); number of lashings varies according to elements, average number being 5 curves on either side, 10 in all. *g*, side view: crossings of turns and laid of one design; braid (3) makes number of horizontal circumferential turns around lashing turns between two wooden elements; end of braid fixed by half hitches around last loops. (Diagram adapted from Buck, 29, fig. 5, p. 72.)

1:Beaglehole and Beaglehole E-5 (1934-5)1938 Pukapukans

for a type Rakahangan house, save that the Pukapukan commencement differs slightly from the Rakahangan technique. The Pukapukan lashing is shown in figure 9. This lashing is extremely common in Pukapuka on both houses and canoes, and is the only lashing used when it is necessary to fasten together securely two crossing elements.

Thatching

All houses in former days were thatched (*ato*) with coconut roof sheets (*pola kauvi*). The method of plaiting the double coconut sheet is that described by Buck (26, pp. 7-11, figs. 6-10) for Aitutaki. Before being made into roof sheets the coconut leaf midribs are soaked in salt water for a few hours to free them of insects. The roof sheets are attached to the rafters by a continuous two-ply twisted sennit cord (*aka*); the method of passing the cord through the sheets from the inside of the house and back from the outside is that described for Aitutaki (26, pp. 19-21, figs. 23-25). A special thatching needle (*yubi*) is used in Pukapuka, however, to facilitate this work. Two methods are distinguished by which the sheets may be applied to the rafters:

In one method (*ato yimaki lau*), the sheet midribs are all of the same length. They are applied in courses running from eaves to ridgepole, the midribs about one inch apart, contiguous courses overlapping. In the second method (*ato tolo*) some roof sheets are made with short, some with long, midribs. Long midribs (*ai pola*) alternate sheets are made with short, some with long, midribs. Long midribs (*ai pola*) alternate in each course with short midribs (*pu pola*) and the sections running from eaves to ridgepole are not dubbed as in the *ato yimaki lau* method. The *ato tolo* method of applying the sheets is more laborious than the *ato yimaki* method, but a well-thatched roof of this type is more apply waterproof and lasts up to 10 years, whereas an *ato yimaki* roof, though more easily and quickly applied, rarely lasts longer than four to five years.

In thatching a roof section, a long doubled sheet (*pola tumuti*) is placed on the rafters above the eaves. A long sheet is placed on top of this and the lashing to the rafters commences. Short sheets alternate with long sheets. As the thatching advances up the side of the roof, a worker lifts up the roof sheets to those who are lashing from the inside by observing them with a lifting pole (*tuku pola*), which has the customary shoulder point. In both methods of thatching it is arranged that the last sheet to be applied to the sides is a long one. On top of this and overlapping the ridgepole break (*ati*) between the thatchings of the two sides is placed another sheet (*pola ati*), covered by still another sheet (*pola tuapato*). Over all is placed a coconut ridging mat (*tuhipou tuapato*), made of two split half leaves and one whole leaf as described for Aitutaki (26, pp. 24-26, figs. 28-34). The gable ends are thatched in the same manner, starting from the double sheet at the eaves and working up to the ridgepole. The sheets are shortened as the thatching comes close to the ridgepole. At the top a small space is usually left for ventilation, and at the sides the edges of end sheets are often wedged in between the sheets that form the side thatching. Some leave the overhanging sheets at the eaves ragged and irregular, but others carefully trim the eaves edge of the sheets in an even line (*kaolkoi te tukutuku vaale*).

When heavy winds are expected, the thatching of coconut-leaf sheets is reenforced by knotting together the tip ends of two coconut midribs, which are then slung over the roof thatching in such a way that one midrib falls

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341 on one side of the roof, the other midrib on the other side. Where the roof
154 is low, leaflets at the butt end of each midrib are carried under the eaves
335 and tied to a thatch rafter. Where the roof is high, the weight of the midribs is sufficient to hold down the roof securely. A number of these double midrib slings are placed at intervals along the roof for added protection.

[177] House thatching with pandanus leaves was introduced into Pukapuka by missionaries from Rarotonga. The method in use conforms in every particular to the Aitutaki method (26, pp. 11-24):

314 Pandanus leaves are collected in the reserves, and straightened (*uwe kaumala* or
322 *pepelo kaumala*) by passing them around an upright stick (*labae uwe kaumala*). The
285 leaves are then fastened in bundles (*pohei kaumala*) by placing the tip end of each leaf over the butt end and tying the ends of a number of leaves together. The leaves are beat over and sewn to strips of wood split from the aerial roots of the pandanus. A sewing needle (*tui*) is used to split the longitudinal grain of the pandanus leaves so that the coconut leaf midribs (*tuaiola*) may be inserted to keep the leaves in position on the wooden strip. The completed roof sheet is termed *pale kaumala*.

Framework Construction

341 Pandanus wood is used almost exclusively in the framework of the
330 *wakeyamoa* type house. Formerly the wall posts were buried about 12 inches in the ground, but in a modern house of this type, four ground posts are supported on low, grooved coral stones and the wall posts are fitted to these ground posts by mortise and tenon joints. In the modern house the tendency is also to fit together tiebeams, wall and roof plates with mortise and tenon joints, but in the old house this would have required much labor with shell adzes. Hence only the tops of the wall posts were grooved (*wakaula pou*) to receive the wall plates, the heads of the rafters chipped out (*wakatala*) to fit against the ridgepole, and roof plates grooved (*wakahawa*) to fit against the tiebeams. If it is necessary to leave a house framework unthatched for several days all the principal posts are wrapped with coconut-leaf mats (*takapau*), and rafters are covered with a few coconut midribs, to protect the timbers from rotting or warping in sun or rain.

Wall Mats

341 In old houses of the *wakeyamoa* type, walls are made with coconut-leaf
285 mats (*takapau*). Mats are made long enough to overlap two wall poles, the depth of plaiting for each mat being about 12 inches. In a typical house,
284 four mats form a set between each pair of wall poles. The mats are supported at their upper, midrib edges by two or three sennit cords spaced equidistantly between the two edges. The method of support is the same as the Samoan method (27, pp. 73-74, fig. 79). The mats operate as a Ven-

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1:Beaglehole and Beaglehole E-5 (1934-5)1938 Pukapukans

tian blind system and are raised and lowered according to the direction of the prevailing wind. The overlap of the mat screens against the wall poles prevents their being blown inward by the wind.

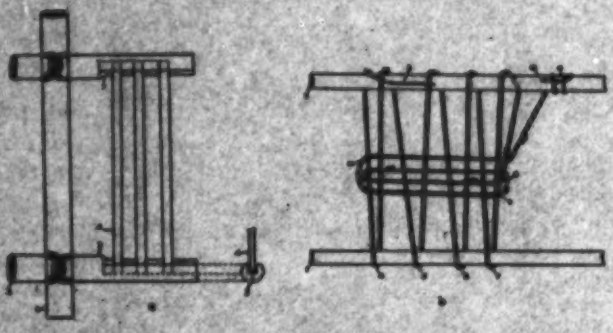

FIGURE 10.—Details of house construction. *a*, making of house wall (*uaiuai*): 1, wall post; 2, horizontal wall lugs; 3, point at which slotting of inner surfaces of wall logs commences; 4, thin rails fitting at each end into slotted wall logs. *b*, suspended loop lashing (*sinnu uaiuaiuai*), bracing first and second ridgepoles (*tau matua, tau lua*), also bracing third and fourth ridgepoles (*tautolu* and *ua maaoli*) in model *waiu atua* house: 1, main ridgepole; 2, second ridgepole; 3, buried commencement end of sennit bound laid on ridgepole; four figure-of-eight turns (4, 5, 6, 7) made around both ridgepoles; free end (8) passes in one circumferential turn round four figure-of-eight turns; free end then passes (9) through lower loop of figure-of-eight and back through upper loop (10); lashing finishes with overhand knot made on one cord of outer loop or else free end passes up to second ridgepole where it makes two or more turns (11) and finishes buried underneath two turns (12) and pulled tight.

Wooden Walls

Low walls (*uaiuai*) are sometimes added to dwelling and cook houses of the *unkeyanua* type by the following method, said to be old:

Two *puatanua* logs about 6 inches in diameter are run between the wall posts, one log at ground level, the other about 30 inches from the ground. A rough slot is hollowed out about 3 inches deep and 2 inches wide on the inner surfaces of the two logs. A series of *pouyau* poles, about 3 feet long and 1½ inches in diameter, is inserted vertically between the two logs, the upper and lower end of each pole resting in the slots. This wall, which resembles a close-set railing fence (fig. 10,*a*), incloses the house on three sides, leaving one end open for a door. On the outside of this low wall and between the top of the wall and the roof eaves (if the eaves are high), *tukupau* mats are hung for extra protection. Cook houses rarely add the extra mat protection unless they are in exposed situations. The method of adding a wall to a house by inserting horizontal slats between uprights and tying the slats together by a continuous cord of sennit is modern and introduced from Rarotonga.

1:Beaglehole and Beaglehole E-5 (1934-5)1938 Pukapukans

Home Platform

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Most dwelling houses and a few cook houses are built on a platform of coral rubble (*paapoa*), several feet larger than the ground area of the house. The rubble is contained by a curbing of coral stones 8 to 10 inches high. Some houses are built on a secondary or upper platform of rubble limited by a coral or log curbing, which forms the house floor and extends about 12 inches beyond the walls of the house. Most houses in the copra settlements are built on a single low platform, gravel inside the house being retained by log curbings.

Variations on Type House

Variations on the type house are found in the copra settlements.

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One house on the back beach of Uta conforms in all particulars to the *uakeyamoa* style, save that the ridgepole is supported by two ridgeposts, which stand on the inner side of the end tiebeams. This house combines features from the *uakeyamoa* type and the *uale sina* type. Most houses on exposed beaches are permanently covered on three sides with *tukapua* mats or *pola* roof sheets fastened to wall poles. Only the leeward side of the house is left open between the ground and low eaves. In exposed situations, cook houses and dwelling houses of the *uakeyamoa* type are provided with roof extensions (*taumata*) to cover ovens or to provide a roomy wind break. The rafters on the exposed side of the house are extended to about 18 inches or 2 feet from the ground and supported on subsidiary wall posts and a subsidiary wall plate. The extension is thatched, and permanent *tukapua* mats are fastened to the outside of the subsidiary wall posts.

A small typical *uakeyamoa* house, used as a sleep house in Yato village, measured 15 feet 8 inches long, 11 feet 7 inches wide; the eaves were 4 feet 6 inches from the ground; and the ridgepole was 9 feet 7 inches from the ground.

Storage Houses

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Houses of the *uakeyamoa* type used as storage houses (*uale takataka*) for nuts, fishing gear, or old canoe sections are often built far enough from the village to be safe from fire, but near enough to be easily visited. The floor of a *uale takataka* is used either as a place for lumber storage, or as a workshop for craft activities. According to the number of nut trees a man owns and the number of nuts he has to store, he possesses one or more *uale takataka*. Four houses was the usual number for an average family in former times, before copra was made.

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Storage Platform

Nuts at the *takataka* stage are stored on a platform laid on the tiebeams and occupying the whole area marked out by the tiebeams. The lengths of wood forming the platform and the rafters are laid very close together to prevent the intrusion of thieves. Legitimate entry to the platform is made through one or two gates or hatch-

Beaglehole and Beaglehole E-5 (1934-5)1938 Pukapukans

313 345 354 ...ways built into the corner of the platform. Formerly the bottom hatch (*pe loa*) was level with the platform and locked to it by complicated knots supposed to be known only to the owner of the house. When in use, the fastenings were untied and the hatch placed on the ground. The top hatch (*pe tai*), about 12 inches directly over the first hatch, was linked horizontally to the top ends of this vertical pole, which were locked at the bottom to the platform supports. The two hatches and the vertical supporting poles thus formed a sort of box resting on the platform. On visiting his male tabooshe, the owner took with him a block of wood which he placed on the ground under the hatch. He removed this block to unfasten the first hatch, inside of which he usually kept a length of rope. One end of this he fastened to the platform and then, by the help of the hanging rope, scrambled up to open the second hatch. On leaving, he securely fastened the hatches, untied the knots, placed his piece of rope on the platform, and carried off his block of wood. After which manner a short ladder, something like a truncated 343 417 414 177 gravel's ladder, came into general use to reach the platform hatches. This was called *kaka*, a name probably derived from the word "stool". It was kept in the owner's sleep house when not otherwise needed. I saw no male tabooshe house with two hatches in the storage platform. The above description is based on informant's account of old time practice. Many houses today, however, have the single hatch, which as often as not is fastened with hinges and padlock to the platform.

HINGE-POLE, WALL PLATE HOUSE

341 344 The type *male atua* house is a bilateral wall plate house with two or more ridgepoles supporting the ridgepole (fig. 11). The type house was used in former days principally as a god house (*male atua*), but the massive construction style made the same type of house ideal for a meeting or watch house. Smaller houses of this type were occasionally used as sleep houses. There are available for study today the watch house at Matuku, erected 75 years ago (described as type), a sleep house on the outer beach of Ute, and a model male atua house (Cb186)[1]. Brief mention of certain features of the framework of the watch house has already been made by Macgregor (1929-43).

The watch house was originally constructed with six wall posts. A seventh post has been added at a later date to give added strength. The wall posts of *puapua* wood are each about six feet's length in the ground. Each post is round in cross section, save at the top where it is cut to a roughly rectangular. The top of each post is grooved to receive the wall plates of puatanu wood, which are laid in the grooves, unlashed (fig. 11). Two tiebeams are placed transversely across the wall plates, one tiebeam at each end, and the other three equi-spaced along the length of the house. The end of each tiebeam is grooved to fit securely over the wall plate to which it is lashed. The ends of the tiebeams are flush with the wall plates. Two ridgeposts of *puapua* wood, buried in the ground at one end and grooved at the other end, support the main ridgepole of puatanu wood which rests in the grooves and is unlashed. Each ridgepost rises from the ground on the inner side of the second tiebeam from each end; about 2 inches separate ridgepost and tiebeam. Running between wall plate and ridgepole on either side of the house are six principal rafters of puatanu wood. Each rafter is round in cross section but is grooved at each end to fit against ridgepole and wall plate, to which it is lashed. Each rafter at its lower end projects about 3 inches beyond the wall plate. The under surface at the end of the rafter is flattened that the square surface of the cross guide may fit more closely to it before lashing (fig. 11*c*).

[1] Other otherwise noted, all references to numbers in Section 2, Bishop Museum.

1:Beaglehole and Beaglehole E-5 (1934-5)1938 Pukapukans

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On each side of the house 25 thatch rafters (kaye) of *puapua* wood are lashed to the eave and midway purlins. At the top, each pair of thatch rafters crosses above the ridgepole to support a thatch ridgepole to which each rafter is lashed. At the bottom, the thatch rafters are lashed to a thatch purlin which passes longitudinally on top of the series of rafters.

Each gable end is formed first by three principal end rafters of *unhemaru* wood which are lashed to the end tiebeam. The two outermost end rafters run between the end tiebeam and the two outermost side rafters, being lashed to these about two-thirds of the distance from the lower ends of the side rafters. The middle end rafter runs from the end tiebeam to the main ridgepole and is lashed to it at a point 3 feet from the end of the ridgepole and on the inside of the first two principal end rafters. To the bottom ends of these end rafters is lashed an end eaves purlin. The nine end thatch rafters are lashed at the lower end to an end eaves purlin, and at their upper end to the second side thatch rafters. Thus the gable ends of the house incline obliquely inward so that the main roof projects beyond the gable end for a distance of about 2½ feet.

The lashings of this house are of two kinds. The lashing of thatch rafters to eave and midway purlins and to thatch ridgepole, and of the end thatch rafters to the side thatch rafters is by a continuous cord of three-ply braided sennit, ⅛ inch thick, which takes two transverse turns around the two crossing elements, then makes a single circumferential turn around the transverse turns between the two elements, and passes to the next crossing elements. All other lashing is the typical Polynesian alternating curves pattern lashing with three-ply braided sennit, ⅛ to ¼ inch thick.

The thatching of this house is with coconut roof sheets, the method being that described for the male undergarment house.

The floor is covered with coral gravel which is retained by lengths of timber laid on the ground on the inside of the wall posts.

Principal measurements of this male adze type watch house are: length, 34 feet; width, 14 feet; height of wall posts from the ground, 4 feet 10 inches; height of eaves from the ground, 5 feet 10 inches; height of ridgepost, 10 feet 2 inches; diameter of ridgepost, 5 to 6 inches; diameter of wall posts, 9 inches; diameter of tiebeams, 6 inches; diameter of principal rafters, 4 inches.

Variations

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The construction of the sleep house on the outer beach of Uta and that of the model house in Bishop Museum are identical with the basic structure of the watch house first described, except for the following variations:

Sleep house. This house has four ridgeposts, grooved to hold the ridgepole. There are four wall posts on either side of the house, grooved to receive the wall plates. Four tiebeams are placed on these wall plates, their ends flush with the wall plates. Rafters cross above ridgepole to take thatch ridgepole, and are flush at their lower ends with the wall plates. There are no purlins or thatch rafters, roof sheets of coconut being fastened directly to the rafters. Along the windward side and west end of the house, there are subsidiary wall posts, each 2 feet apart, which are lashed at their upper end to the wall plate or end plate. The thatching from the roof or end is continued to the ground on these sides, the coconut roof sheets being applied directly to the subsidiary wall posts to form a permanent wall. At the east end of the house, the end rafters run out at an angle of 60 degrees from the side rafters, and are supported at their lower end by six low end posts, each 20 inches high, and an end wall plate. The east end thatching continues to the ground, and the end thatching is tied directly to the end wall posts. The whole of the south (leeward) side of the house is permanently open. This house is 25 feet long and 20 feet wide; the ridgepost is 6 feet high, and the eaves on the south side are 3 feet from the ground. The house is low, strong, and compact, well

I:Beaglehole and Beaglehole E-5 (1934-5)1938 Pukapukans

[342] adapted to withstand the fierce gales from the northwest that strike this exposed beach with full force.

341 339 Model house combining features from both the *unaʻ wahayenoa* and the *unaʻ atua* types. This house has five wall posts on either side, two wall plates, and six tiebeams, which project beyond the end of the wall plates and support two roof plates. There are four ridgepoats, one on the inside of each of the end tiebeams and one on the outer sides of the third and fourth tiebeams. Eight principal rafters on each side run from the roof plates and cross above the main ridgepole to support a rafter ridgepole (*tau lua*). There are two purlins on either side, an eaves purlin and a midway purlin. The midway purlin on one side is narrower than that on the other side. In order to keep the thatch rafters on both sides equidistant from the principal rafters, the narrower purlin is given additional width by chocks (*seinei*) inserted between purlin and rafters. Thatch rafters run on the outside of the purlins. At the top, they support on the under side a third ridgepole (or a thatch rafter ridgepole), *tautolu*, which is separated from the rafter ridgepole by chocks (*seinei*) but is lashed to the thatch rafters. On top of the crossed thatch rafters is laid a fourth ridgepole (or thatch ridgepole), *uta monoli* (fig.11,*b*). At the bottom, the thatch rafters support a thatch eaves purlin.

At each gable end, end wall plates (or additional tiebeams) are lashed at each end to the ends of the side wall plates. The principal end rafters are fastened at the top to the second side rafters, all save the center end rafter which is fastened to the main ridgepole between the second and third side rafters. At their lower ends, the end rafters are lashed to the end wall plate, but project downward and beyond this to support an end eaves purlin, which in itself fastened at each end to the side eaves purlins. The end wall plates are braced by two struts (*yoke*) which are lashed to the two outer tiebeams and project far enough to be lashed to the end wall plates. The end thatch rafters run on the outside of the end eaves purlins to the first rafter on either side. On the bottom outside of the end thatch rafters is lashed a thatch rafter eaves purlin, which is itself joined at each end to the side thatch rafter eaves purlins. The ridgepole is further strengthened by two diagonal braces (*yoke*), each brace running from the middle of the third tiebeam (counting from each end) to the main ridgepole, and lashed to both tiebeam and ridgepole.

341 335 284 The lashings of this house conform to Pukapukan pattern. The central principal rafters and the diagonal braces, which both lie against the main ridgepole obliquely, are lashed to the ridgepole by four transverse turns which are themselves tightened by three circumferential turns (*yiuu nukapolo*). The first and second ridgepoles and again the third and fourth ridgepoles are braced against each other by five transverse turns of cennit which are made taut by three or four circumferential turns, thus forming a suspended loop lashing (*yiuu wahanoa*; fig.10,*b*).

341 335 The variations in this model *unaʻ atua* type house bring it close in type to the *wahayenoa* house, the only distinction being the use of ridgepoats in the model and the heavier construction of the roof framework. It was suggested by informants that the reason for projecting the tiebeams beyond the level of the wall plates, and then adding —of necessity—roof plates to support the principal rafters, is to protect wall posts of pandanus from exposure to the weather. By projecting the tiebeams a sufficient distance (from 12 to 18 inches), low eaves would give ample protection to the wall posts, especially if thin poles are run between the ends of the tiebeams and the ground to support wall sheets. If these poles rot, they can be replaced easily, but it is difficult to replace main wall posts without pulling down and rebuilding the roof framework.

House Furnishings

352 513 Furnishings of the Pukapukan house are of the simplest kind. People sleep on coconut leaf and pandanus sleeping mats laid on the coral pebble floor or on wooden platforms. When not in use, mats are rolled (*tapolo*)

1:Beaglehole and Beaglehole E-5 (1934-5)1938 Pukapukans

354 372 especially for evening prayers and for all-night vigils over a corpse. Out-of-doors light, on dark nights of the moon, is provided by small coconut-shell fires. When dry shells are plentiful a number of half shells are strung together on a strip of pandanus material (*lito*) about 2 to 3 feet long by passing one end of the pandanus strip through the soft eyehole of the half shell. Two parallel rows of these shells are placed on the ground and a few dry shells rested on top of the two rows. The shells are lit at the windward end with a *tuuma* torch and burn with a fierce flame. Such a firelight torch of dry coconut shells is termed *loma ngaipa*.

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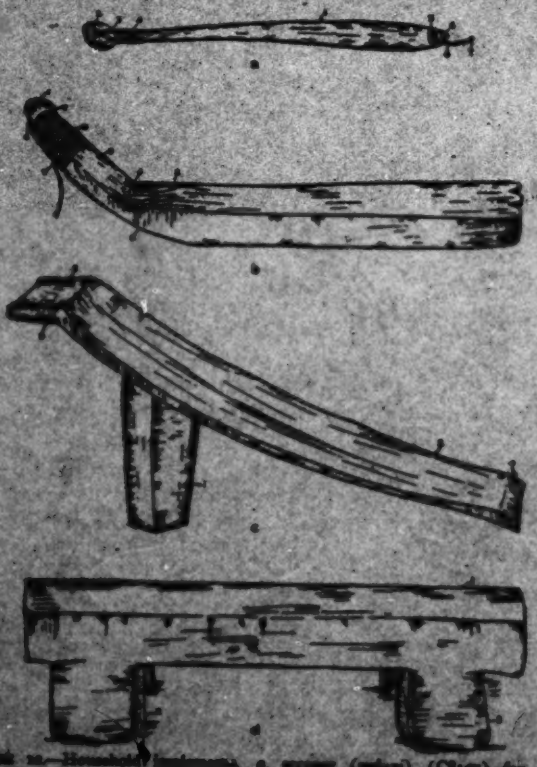

PLATE 22.—Household implements. a, scraper (*nakep*) (Cat.9) for removing husk in making coconut water container; handle of *ngangia* wood (1) 13¼ inches long, 1 inch thick at proximal end, and ⅝ inch thick at distal end; under surface of handle slightly concave longitudinally; distal end of handle inserted into carefully shaped hole

1:Beaglehole and Beaglehole E-5 (1934-5)1938 Pukapukans

in scraping shell (*vuluvi*, *Nerita polita*) a little to left of apical whorl; four lashing turns of fine three-ply sennit braid (3) pass from handle through shell (2) where commencement end is buried, lashing continues with 16 transverse turns around distal end of handle (4); finishing of lashing buried beneath last turns; at proximal end a thin cord (7) of twisted *wau* fiber is attached so that the scraper may be hung up; two notches (5, 6) cut in handle; the two plies of *wau* cord lapped about notch (5) and fastened with figure-of-eight turns of fine, two-ply twisted sennit which pass around handle and between two notches; free end of sennit seized (8) around *wau* cord and finishing end buried. *b*, coconut stand grater (*tuai*) (C8106): clam-shell grater (1) mounted on wooden stand (2) cut from solid block of *tutua* wood; horizontal base 1 foot 10¾ inches long, 4½ inches wide at proximal end, and 2 inches thick; two triangular notches cut into proximal end said to be old form of ornament; oblique arm (3) 7 inches long, 3 inches wide, and 2 inches thick; angle (4) at which arm leaves horizontal base obtuse, under side (5) shaped and rounded off slightly; distal end of oblique arm (6) slotted for depth of 2 inches and concave so that convex outer surface of shell grater fits securely against arm; a piece of cork (7) fitted against inner concave surface of shell grater; lashing of three-ply braided sennit (8) applied over cork and around arm; lashing consists of 24 turns with buried commencement, and under normal conditions finishing end would also be buried, but in this grater free end is not cut off flush with transverse turns but is knotted and left free (9) so that grater may be hung up by free end. *c*, back rest (*tuhe*) cut from solid block of *waksaavo* wood (C8161): 1, four-sided stand 8¾ inches high at back and 5¾ inches high at front, sides about 2½ inches wide; 2, main backrest, surface of which has slight transverse and longitudinal concavity, 2 feet 3½ inches long, 9½ inches wide, and ¾ inch thick at edges; continued by horizontal extension rest (3) 4 inches long, ¾ inch thick at sides; 4, end resting on ground has bevel 1½ inches wide; 5, under surfaces of horizontal extension (3) shaped obliquely, coming together in short medial longitudinal ridge 1¾ inches high. *d*, wooden headrest (*akanga lakau*) (C8184); roughly cut from single block of *fenfuo* wood: 1, pillow section 1 foot 7 inches long, 3 inches wide, and 2¼ inches thick; 2, four legs, each 5½ inches high, 3¼ inches wide, and 2 inches thick; 3, slight flare at base of right front leg due to unskilled workmanship and not to design.

Furnishings of Pukapukan houses today include little that is modern. Occasionally one sees a European chair. Most houses have wooden chests or suitcases in which clothes are kept. European mosquito nets are in common use, and several houses proudly display antique sewing machines. Beyond these few articles and bundles of mats, the house interiors are generally quite bare.

FOOD UTENSILS

To harvest and husk coconuts, the climbing bandage (p. 146), husking stick, and carrying pole are used. The husking stick (*koyo*, C8049) of *ngangie* wood is driven into the ground for two thirds of its length. Informants were sure that the short stick was the only type used formerly, the worker kneeling or squatting on the ground to husk. Today, a much longer stick is generally used, the husker standing and bending over the stick. The carrying pole (*amo*) is a convenient length of coconut leaf midrib on which a nick is made at each end. Pairs of nuts are slung over the pole, the

1:Beaglehole and Beaglehole E-5 (1934-5)1938 Pukapukans

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and from their scarcity. The quadrangular basaltic adz figured by Macgregor (20,fig.14) was picked up on the outer beach of Wale. It is similar to Samoan type I adzes (27,p.334) and was perhaps imported from Samoa. A second basaltic adz was seen by Talainga in the old grave unintentionally opened. From Talainga's description and rough sketch this adz appears to be a triangular one, perhaps corresponding in shape to the Samoan type VII or VIII (27,p.351). It was 10 inches long, the back ground smooth, the front roughly chipped, and the poll rounded. The depth of the bevel was about 2 inches.

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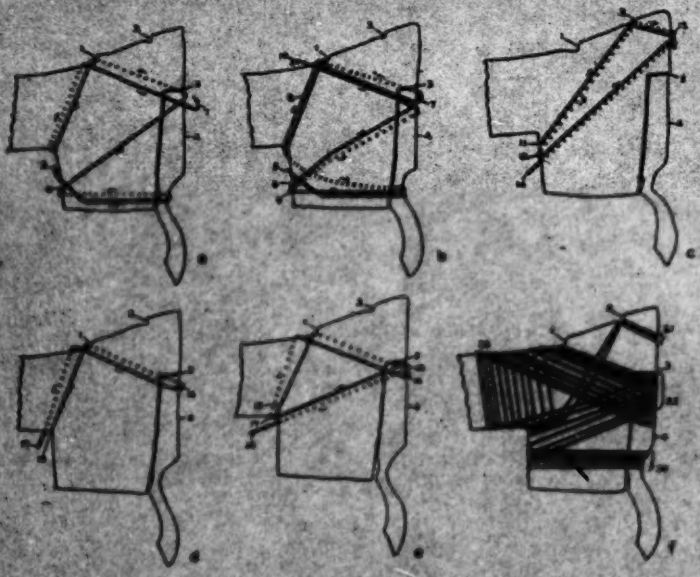

PLATE 21.—*Tridacna* shell adz (Ch.ng) with haft of unknown wood; length of haft from toe angle to slightly flared butt, 19 inches; haft round in cross section, average diameter being 1⅝ inches; at heel angle a prominent longitudinal ridge runs up to point of heel; above heel angle (see *a*) is cut a notch (1) to prevent lashing from slipping; ¾ inch below point of heel a second notch (2) is cut, also to prevent lashing from slipping; 1¾ inches below point of heel on foot of haft is cut ⅛ inch deep shoulder (3), against which adz (4) fits to avert slipping when in use; because of irregular shape of poll of adz, shoulder is cut transversely on foot, so that distance from heel point on one side is 1⅛ inches, other side 2¼ inches; lashing material three-ply cocnut braid ⅛ inch thick. *a*, lashing commencement: commencement end of sennit (5) laid under toe angle, free end passing transversely around near side of toe and back across far side of toe, and brought across toe angle to near side; gripe commence-

1:Beaglehole and Beaglehole E-5 (1934-5)1938 Pukapukans

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ment end, and passes at 6, on near side, diagonally up to shoulder (3) where it grips poll of adz, passes across far side of heel, and is brought to near side over notch 1, across to toe angle; it makes a turn under toe angle, passes to notch 1, on far side, and then across heel on near side, gripping first diagonal turn (7) of sennit from toe to heel. *b*, continuation of lashing: free end (7) passes across shoulder (3) and across heel to notch 1, where it is brought across to near side and down (8) to near side toe angle; from toe angle it passes to far side of toe and makes a transverse turn around toe, coming back on near side and passing under toe angle (9) to make diagonal turn on far side up to shoulder; brought around shoulder to near side and passes across heel (10) to notch 1, where it passes down far side of heel to make further turns, as described, until four complete turns are made of which, for clearness, only two are shown in *b*. *c*, lashing of point of heel: fourth completed turn brings free end of sennit into position at 11, to make two turns around point of heel; sennit passes diagonally across near side of foot from toe angle to heel, crosses to far side of heel at notch 2, passes across heel and is brought to near side of heel (12) and diagonally down on near side to toe angle; sennit crosses under toe again (13), runs diagonally up to heel on far side and is brought across notch 2, to near side of heel, then across heel and diagonally down on far side to toe angle (14); sennit then ready to make two more turns, repeating diagonal movements between toe angle and heel; four diagonal turns in all, of which only two are shown in *c*. *d*, continuation of lashing: last turn of diagonal lashing brings sennit into position (15) for further turns; sennit passes on near side from toe angle to notch 1, where it lies on top of turns made as in *b*; sennit crosses to far side of heel, then crosses heel to shoulder (3) and goes around to near side of heel and across heel to notch 1 where it passes to far side of heel and down to toe angle (17), forming lower loop (16) of this phase of lashing. *e*, sennit (17) comes around under toe angle and goes diagonally across to heel; turn continued around heel to far side to make upper loop (18), then diagonally down on far side to toe angle; this brings sennit (19) into position to repeat turns as in *d* and *e*; altogether six turns are made, lower loop alternating with upper loop, and free finishing end of sennit brought up on near side of toe angle and buried underneath last two turns at heel angle. *f*, completed lashing: 20, first four turns made around toe, binding lower part of adz to toe of haft; 21, four diagonal turns around point of heel and notch 2; 22, final six turns, alternating lower with upper loop; 23, point where end is buried to complete lashing.

Drill

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The pump drill (*wero*) was formerly used to drill holes in wood and shell. It was of a common Polynesian design (fig. 22).

To drill a small hole or to drill fragile articles, a light balance was required; for this purpose one half of a dry coconut shell was put on the shaft by pushing the shaft through the soft eye of the shell, the eye part of the shell pointing downward, the open half of the shell pointing upward. To drill a large hole in hard material, a heavy balance was used, the wooden balance on a drill being reenforced if necessary with extra weights of wood.

The point of the drill was of shell or iron. Informants were at pains to point out that the Pukapukans were aware of iron long before white contact. They procured nails from pieces of boat wreckage which from time immemorial have drifted onto the outer beaches. They burned the wreckage and combed over the ashes for nails hammered into the wood.

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To drill is also *uru*. The worker started a hole by holding the shaft of the drill between the palms of the hands and rotating it. When he had made the slightest depression to hold the point, he worked the drill with the *pana* handle.

1:Beaglehole and Beaglehole E-5 (1934-5)1938 Pukapukans

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A craftsman took great care of his drill. He rubbed the shaft, crossbar and balance smooth with coral, smoked the wood over the cooking fire and oiled it afterward with coconut oil. The fortunate possessor of a drill with an iron guard point guarded his implement jealously because as a time saver it was of the greatest value to him.

Awl

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The shell awl (*yuki vuka*), a shell *Terebra cranulata*, was used for making holes in a canoe hull or washstrake where the drill could not be used, or for enlarging holes made by the drill. (See p. 173.) The use of coral mallets for hammering caulking wedges is also described in that context.

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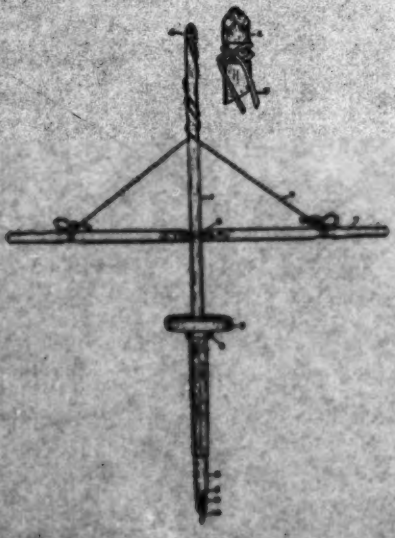

Fig. 121.—Pump drill, uwe (C8124): 1, shaft (*lakau tu*) of wetoo wood 2 feet 6 inches long, round in cross section and ¾ inch in diameter above balance, square-sided below with sides ½ inch wide; 2, distal end of shaft is round, ½ inch in diameter, narrowing to distal point (3) ⅛ inch in diameter; 4, head (*ulo uwe*) of shaft blunt and notched to receive pump cord (*aho uwe*); 5, balance (*potaka*), 4 inches in diameter and ¾ inch thick, cut from same block of wood as shaft; 6, secondary balance 1¾ inches square, ⅛ inch thick; 7, crossbar (*lakau uwe*) of wakeuwe wood, 1 foot 9 inches long, late wide groove (8) to fit against shaft; each end also grooved to receive ends of pump cord; 9, pump cord of two-ply twisted sennit, fastened with clove hitch to head of shaft and to each end of crossbar; 10, point (*meto*) section of iron forced into end of shaft and lashed tight with 11 transverse turns of three-ply sennit braid; 11, lashing commencement and finishing ends.

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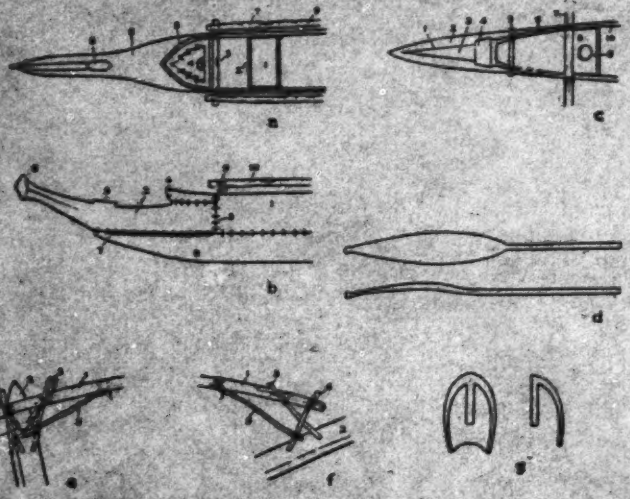

FIGURE 26.—Details of six-boom canoe. *a*, stern, top view: 1, stern seat; 2, groove under after edge of stern seat for holding bonito rod in place, summit grommet in which handle of pole rests not shown; 3, groove cut in aft crossbar against which rod rests; 4, bait deck; 5, stern wave guard; 6, cleat on stern cover; 7, short longitudinal spar; 8, stern cover; 9, gunwale. *b*, view of starboard side: 1, washstrake; 2, stern cover; 3, through-and-through lashed join of washstrake and stern cover; 4, raised side piece of wave guard lashed to stern cover; 5, cleat; 6, fishtail-shaped stern cover; 7, outer rod caulking over join between stern cover and (8) after section of hull; 9, bar rest for trolling rod; 10, short longitudinal spar between which and top of washstrake (11) lifting poles are inserted. *c*, bow: 1, fore section of bow cover; 2, after section of bow cover, lashed join between [illegible] and after sections not shown; 3, deck of bow cover; 4, bow wave guard; 5, forward cross lifting bar; 6, lashing of aft end of bow cover to forward end of washstrake; 7, bow outrigger boom, lashed across washstrake; 8, bow seat with hole (9) for forward mast (modern technique of stepping mast); 10, washstrake. *d*, inner paddle (*uto*) of *pukaua* wood, face and side view: handle 2 feet 4 inches long, about 1½ inches in diameter; blade 2 feet 7 inches long, greatest width 3½ inches; terminal knob 1¾ inches long, 1 inch thick; weight of paddle 3 pounds; one side of paddle blade convex transversely, slightly concave longitudinally; other side slightly convex longitudinally, flat or faintly concave transversely; distal end of blade with faint medial transverse ridge which meets two edges (*kaukau*) of blade to produce terminal knob with four sides and blunt point; paddles range in length from 4 feet 8 inches to 5 feet 6 inches, blades 3 to 6 inches wide; size and weight depend on choice and strength of maker. *e*, outrigger boom, end attachment: 1, bow boom; 2, outrigger float; 3, inner pair of connecting pegs, crossed above boom and running obliquely outward to float; 4, outer pair of pegs; 5, diagonal brace between boom end and after connecting pegs of inner and outer pairs; 6, suspensory lashing holding float to boom. *f*, middle boom attachments found only on larger canoes such as this six-boom canoe: 1, outrigger boom; 2, outrigger float; 3, inner connecting peg; 4, outer connecting peg; 5, diagonal brace between boom and outer connecting peg. *g*, canoe bailer (*tata*) of washstrake wood top view and longitudinal section; handle projects from medial line of top of back; sides and bottom rounded and meet at back in slight medial longitudinal ridge which continues along outside bottom of bailer to meet customarily beveled lip (not shown); bailer 14 inches long, 6¾ inches wide, 3 inches deep; lip bevel ¾ inch wide; weight of bailer 3 pounds. (Reproduced from Macgregor, 20, fig. 12.)

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The Pukapukan *twi tuta* canoe is shown in figures 24, 25, 26 and plate 5,*A*. The native names for parts of the plank canoe are given in the following list:

Mua vaka: fore section of hull.
Waaloto: central section of hull.
Muli vaka: aft section of hull.
Oa: washstrakes.
Velo: stern cover, shaped like fishtail.
Lauiau velo: after projection of stern cover.
Talamoko: raised cleat on stern cover.
Wakakauvae wonu: raised bait deck on stern cover, fashioned from cover or built up with extra wood.
Tuku: place inside wakakauvae wonu where bait and line are laid.
Kalonu: extreme after point of after section of hull.
Tala tuki: point of bow.
Tuki: forward part of bow cover.
Puka: second section of bow cover.
Tala puka: wave guard on bow cover.
Malae puka: top of wave guard.
Pu oyo: place covered by bow coyer where provisions and fishing gear are stored.
Kaukau: outrigger cross booms.
Kaukau mua vaka: forward outrigger boom.
Kaukau muli vaka: aft outrigger boom.
Kiato: longitudinal spar supporting cross booms.
Mani poto: additional short cross booms, supporting kiato and running from strakes to spar.
Ama: outrigger float.
Main ama: bow and stern points of outrigger float.
Tutuki: connecting pegs between outrigger float and cross booms.
Tutuki tokai: diagonal bracing strut running from inner pair of pegs to boom.
Oango: suspensory lashing supporting outrigger float.
Mana ki mua: forward lifting bar.
Mana ki muli: stern lifting bar.
Mana a lau: crossbar aft of after cross boom.
Pulepale lingayu: short longitudinal spars lashed on either side of washstrake to lifting bar and cross boom.
Lalaua iki: lifting pole.
Tuinga iki: sennit lifting loops fastened to starboard washstrake just aft of cross booms.
Yoke: seats formed by cross booms and lifting bars.
Tau muli: rear seat just forward of rear lifting bar.
Kaukau laeau: starboard side.
Kaukau aana: port side.

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The hull is in three sections lashed together (*nau*) with three-ply braid which passes through holes (*pu*) bored (*yubi*) through the hull with the shell implement termed *yubi vaka*. A shell borer might be lashed to a wooden holder about 6 inches long, to make the implement called *wawa*. The point of the shell was held against the wood with the left hand and the wooden holder tapped smartly (*paapaa* or *tukituki*) with a mallet of *kaupapa* coral or a whale's tooth (*tukituki paapaa vaka*). The point was then worked gently from side to side (*laulau* or *waikiwaki*) to enlarge the hole. Tapping and working from side to side continued until a hole was made through the wood. The *wawa* was then twisted (*yubi*) and worked back and forth until the hole was of the required size. The lashing forms a crisscross pattern (*te kaua kae*, fig. 27,*f*). Washstrakes (*oa*) are added to the hull sections with a single diagonal lashing (*te kaua tai*, fig. 27,*a*). Where the *oa* are in several sections, the edges of contiguous

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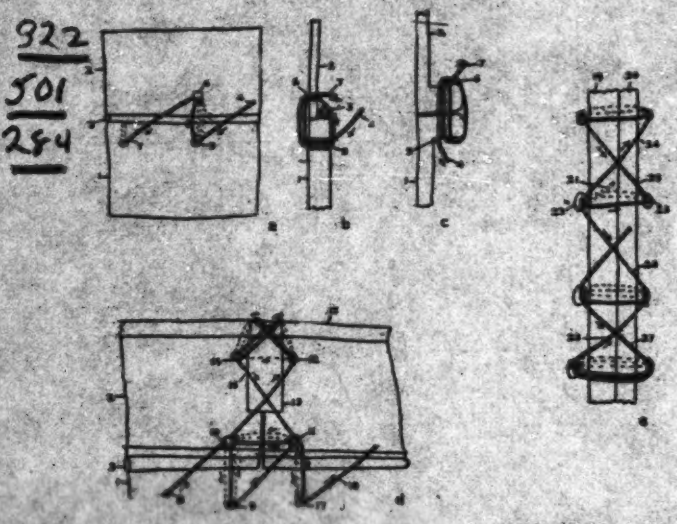

PLATE 27.—Lashing of washstrake to hull: *a-c*, single diagonal lashing (*la kawa tai*); *d*, double diagonal lashing (*la kawa lua*); *e*, inside flange lashing. *a*, view of single diagonal lashing from hull interior: 1, hull section; 2, washstrake; 3, caulking stick (*take*) placed against caulking husk material; 4, commencement end of sennit passes from preceding hole down to inferior hole (5), through to hull exterior, and up to superior hole (6), then back through 6 to hull interior, down to inferior hole; makes one more turn and when brought back through superior hole a second time, passes down to inferior hole (7) ready for next turns. *b*, cross section of same lashing on *tai kolo* canoe (through-and-through lashing): sennit (4) makes two transverse turns through inferior and superior holes (5, 6), securely binding washstrake (2), hull (1), and caulking material (3); 7, free end ready to pass to next inferior hole. *c*, cross section of same lashing on inside flange canoe (*tai au tahi*): lashing (4) makes two transverse turns through holes (5) in hull and (6) in washstrake, and free end (7) passes to next pair of holes. *d*, lashing of contiguous section of washstrakes by double diagonal lashing: commencement end of sennit (8) makes two transverse turns through holes 10 and 9 of washstrake and hull; free end passes to inferior hole (11) in contiguous washstrake section; one transverse turn made between holes 11 and 10, and on second turn sennit passes on outside of canoe, through to inside at hole 10 and diagonally up to superior right hole (12), securely gripping gasket material (13) which is laid over joint of washstrake sections as caulking; sennit passes through hole 12 and along on outside of washstrake to hole 14, back through 14 and diagonally up and over edge of washstrake (15); sennit continues down on outside of washstrake to hole 12, through to inside and diagonally up, over washstrake edge, down to and through hole 14; two more diagonal cross turns made over washstrake edge and free end of sennit brought back and through hole 14 to inside of washstrake; sennit (16) continues diagonally down and across to hole 11, passes through 11 and makes two transverse turns around hull and washstrake between holes 11 and 17; free end (18) passes up to next pair of holes

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sections are lashed by the *te kaua kae* lashing (fig. 27*d*). Caulking material of dried coconut husk (*pulu gae*) is hammered into the joins of hull sections with a cone-shaped wooden caulker (*tamumuna*). The lower edge of the washstrake is set on the upper edge of the hull, flush with its outer surface. Sennit (*kaua ongo uhi*) or coconut husk fiber is laid on the lower edge of the hull; on top of this caulking material is laid a fiber stick (*tuku*). The lashing of strake to hull holds the caulking securely in place (fig. 27*b*). The holes through which the lashing passes are caulked with coconut husk or wooden plugs hammered in from the outside with a rectangular-shaped wooden caulker (*tili*). These plugs keep the lashing tight and prevent leakage and rotting of the lashing. The raised hull deck, which is fashioned from the stern cover or else built up with extra wood is shown in figure 28*a*. The stern cover is lashed to the hull by through and through lashings (*te kaua tai*) and caulked on the outside by fiber sticks (*pukipuki*). The two-piece bow cover is lashed to the forward section of the hull by through and through lashings.

The outrigger is attached to the canoe by cross booms lashed to washstrakes with the gunwale shearing curved lashing which passes over the booms and through holes bored in the strakes. The longitudinal spar is also lashed to cross booms with the shearing curved lashing. The outrigger is fastened to cross booms by connecting pegs (*tatuki*). Bow and stern cross booms are connected by four pegs; additional cross booms by two pegs. The points of the pegs are driven into the outrigger, but not lashed to it. The lashing of pegs to cross booms is shown in figures 28*e*,*f*, and 28*h*. A diagonal bracing strut (*tuteki tokei*) runs from the inner pair of pegs to the boom. The attachment of this strut to pegs and boom is shown in figure 28*g*. A supporting lashing (*ongo*) supports the outrigger and prevents it from separating from the pegs where the canoe is lifted. This lashing is shown in figure 29. The forward cross boom is shorter than the after cross boom. This enables the outrigger float to be fixed so that the fore end of the float is nearer the canoe hull than the after end (see counterweight, p. 184), an arrangement which makes the canoe easier to steer.

The fore lifting bar is lashed across the washstrakes forward of the forward cross boom. A more lifting attachment is made by fastening a lifting bar across the strakes just forward of the rear hull deck. Short longitudinal spars are lashed on either side of the washstrakes to the raised cross bar and cross boom (fig. 30*a*). To lift the canoe, lifting poles are thrust between these spars and the washstrakes from the starboard side and the canoe is lifted by upward pressure on the lifting pole. In large canoes, a lifting pole is also thrust through the lifting loop (fig. 30*b*) and when the weight is taken, the distal end of the lifting pole rests on the port side of the washstrake. All Pukapukan canoes have an extension fore and aft of the *kaua ngae* beyond the fore and aft cross beams, which is a certain nuisance in paddling on the port side of the canoe because the paddle, in being raised from the water, often strikes against this extension. However, to take a canoe through shallow water over the reef, the crew wades and drags or

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te, continuous single diagonal lashing of washstrake or hull as shown in *a*. *e*, double flange lashing of hull sections in hull or hull cover; *ng* and *ns* represent contiguous raised flanges of contiguous hull sections; *lo*, locked commencement and end of sennit on outside of hull; sennit strikes one transverse vitra through holes *ns* and *ng*, then passes diagonally up (*ni*) to superior pair of holes; strikes transverse vitra through holes and passes diagonally down (*ng*) to hole *ng*, makes one turn through holes *ng* and *ns*, again binding commencement end (*ni*); sennit passes diagonally down (*ns*) to next pair of flange holes in hull, makes one turn through holes, passes (*ng*) to next pair; two transverse turns made through lowest pair of holes and sennit brought back to pass diagonally upward (*ni*) to next pair of holes, makes turn through holes, passes diagonally up to next pair; free end passes into hole *ng*, where it fastens by hammering of shrinking wood into flange hole on top of free end.

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pushes the canoe, using the washstrakes and spar extension as shafts. The man in front stands between the side of the canoe and the spar extension, grasping the washstrake with his right hand and the outer extension with his left. Similarly the man in the rear stands and pushes the canoe before him.

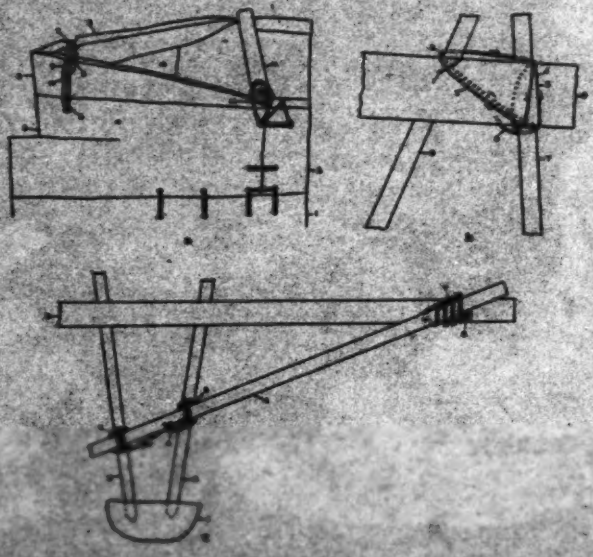

Figure 58.—Canoe construction. 1, two-piece stern bait deck; 2, stern bait section; 3, washstrake; 4, section of stern cover (rule); 5, 6, fitted sections of weed placed on top of forward end of stern cover and lashed to cover by cords which passes over notches 6 and 7 cut on edge of outer sections, and through hole 8, lashed through head of stern cover; lashing consists of buried commencement (9), several transverse turns over notches and through hole, and buried finishing end (10); forward ends of added washstrake combined under first crinsheer (11) lashed to washstrake on either side; lashing (12) assembly binds in place added sections to washstrake; 13, platform of bait deck formed by top of stern cover. b, commencement lashing of connecting pegs to outrigger boom; diagram shows inner pair of pegs (7, 8) and outrigger boom (9); 1, buried lashing commencement; cords passes around far side of inner peg (8), then diagonally down (2) and across boom to outer side of outer peg; continues around far side of peg, then diagonally up and across for side of boom and around far side (3) of inner peg; continues across far side of boom, around far side of outer peg and down (4) near side of outer peg, passing over earlier turn; continues underneath and up far side of boom, down (5) again on near side of boom, underneath outer boom, then ready to pass diagonally up on the side of boom across to top of inner peg (8); lashing continues with 6 figure-of-eight turns around connecting pegs and boom, then two circumferential turns around connecting pegs superior to boom; actual connecting pegs brought close, together above boom so that thick round cross be turned between pegs for two circumferential turns, and shoulders of pegs holds turns tight; free end of cord passes along boom to outer pair

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of connecting pegs and repeats lashing; free end passes down outer connecting peg to commence compensory lashing around float shown in figure 29, *c*, lashing of diagonal brace (*katuki tahai*) to connecting pegs and cross boom of outrigger: 1, cross section of outrigger float into which connecting pegs (2) are driven; 3, outrigger boom; 4, diagonal brace lashed to connecting pegs by alternating curves pattern lashing (5); lashing has buried commencement on outer peg; after completing lashing of outer peg, free end of sennit continues to inner peg, completes similar lashing; free end (6) fastened by double overhand knot to sennit that came from outer peg; lashing of diagonal brace to outrigger boom has buried commencement (7); free end of cord makes three or more transverse turns around brace and boom, then one or more circumferential turns around lashing turns between brace and boom and finishes with overhand knot on last circumferential turn (8).

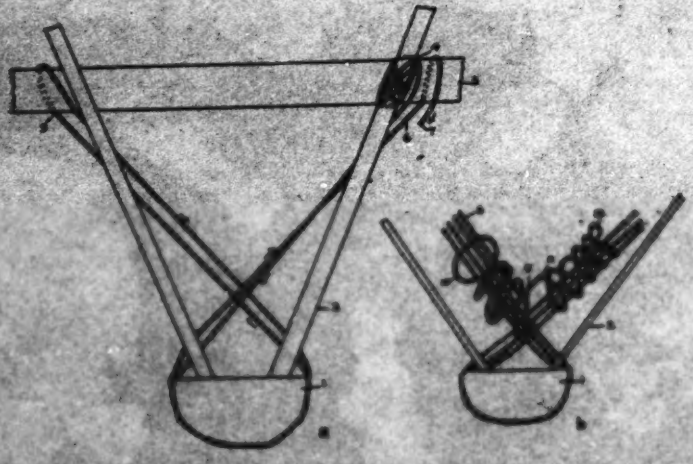

FIGURE 29—Compensory cross lashing. *a*, commencement of lashing between outrigger boom and outrigger float: 1, outrigger float in cross section; 2, connecting peg between float and cross boom (3); when lashing (4) of outer connecting peg to cross boom is finished free end of sennit brought down between double pair of pegs (only outer pair shown in diagram) to inner side of float, passes around under float, up on outside of float and across to boom at 5, on hull side of inner peg; turn made over boom, and sennit brought down to outer side of float, around float, and up on inner side (6) to boom, making turn around boom on outer side of outer peg; sennit (7) continues down to float as before, making altogether five turns around boom and float (two turns only shown in diagram). *b*, continuation of compensory lashing: after fifth turn (fourth in diagram), free end of sennit (8) brought down from hull side of inner connecting peg to pass around and under crossing of compensory lashing (9) and continues up left hand suspension with two transverse turns; a complete final turn made around suspension, and sennit (10) brought back down suspension with two more transverse turns, continuing across to right hand suspension (11); five transverse turns made around right hand suspension with buried end finish (12).

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Flaws in the wood from which hull or strakes are made are cut out and in their place small sections of wood (*tapiki*) or larger sections (*nukakaukau*) are fitted in by hammering and lashed if necessary to the surrounding hull or washstrake wood. Where the washstrake wood is not sufficiently deep, additional sections (*nukapali tai*) are lashed with through and through lashing to the washstrake base until the required depth is attained. Small cylindrical plugs of wood (*topiki* or *mono*) are hammered into small faint or flaw holes in the outrigger float to keep the salt water from lodging in them and rotting the wood.

When surfaces are being fitted together, whether hull sections, or washstrakes to hull, or small patch sections to hull or strakes, the parts to be joined are smeared with a marking material of coconut-shell charcoal mixed with water and applied with a brush made of the chewed fibrous material of the pandanus key. Irregularities in the fitting of the parts are brought out by black marks. These irregularities are then adzed down until a perfect fit (*ave* or *tomomioe*) is secured.

In canoes used in bonito trolling, the rear seat is made of a block of wood which is lashed on either side with through and through lashings to each washstrake. A flange is cut on the under aft side of this seat and a scroll grommet (*matapili*) is lashed to the seat in the middle of this flange. The butt holder (*tuhau*) of the bonito pole (*matila atu*) rests in this grommet and the pole rests in a groove cut in the after lifting bar.

[501] The size of a canoe is indicated by the number of seats (*yeke*) it contains. But a *vaka yeke uo* (four-seater canoe) holds only three men comfortably; a *vaka yeke lima* (five-seater canoe) holds four men comfortably or five men if the hull is especially wide; a *vaka yeke ono* (six-seater canoe) holds six men. From this number of seats upward, the number of crew becomes greater than the formal seating capacity, so that a 69-foot canoe, officially rated as a *vaka yeke hivagauhu uo tolo* (thirteen seater), easily holds 30 or more men. Those that cannot be accommodated with formal seats rest on the edges of the strakes. The size in feet of the various canoes is given below (p. 185).

The hull of the *tatai* plank canoe is of one piece in very small one-man canoes or of three pieces in larger canoes. The hull sections are as before, *nuku vaka*, *nuuloto*, *nuli vaka*. Washstrakes are added and a simple bow cover (*papani hi mua*) and a stern cover (*papani hi muli*). These covers are shaped pieces of wood lashed to hull and to washstrakes (fig. 30,*c*). Very rarely, a small canoe of this type is fitted with the shaped stern piece (*vulo*) and the type bow covers (*tuhi* and *puhe*). Outrigger support consists of two cross beams, connecting pegs, and temporary lashing. The *tatai* dugout differs from the simple one-piece dugout in the addition to the hull of washstrakes and stern and bow covers. The size of typical *tatai* canoes is given below.

The plank canoe termed *vaka tai matoli* (pl. 5,*B*) is distinguished from the through and through lashed canoe (*vaka tai tuto*) by the lashing of hull sections to each other, and of washstrakes to hull, and washstrake sections to each other by means of raised inside flanges (*kongo matoliko* or *kongo tai matoli*). These flanges are about 2 inches high and the lashing is through

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holes drilled through each flange (fig.27,*c,e*). No lashing shows on the outside of the hull. This lashing method may be applied to plank canoes of all sizes from the simple *tatai* canoe to the largest canoe.

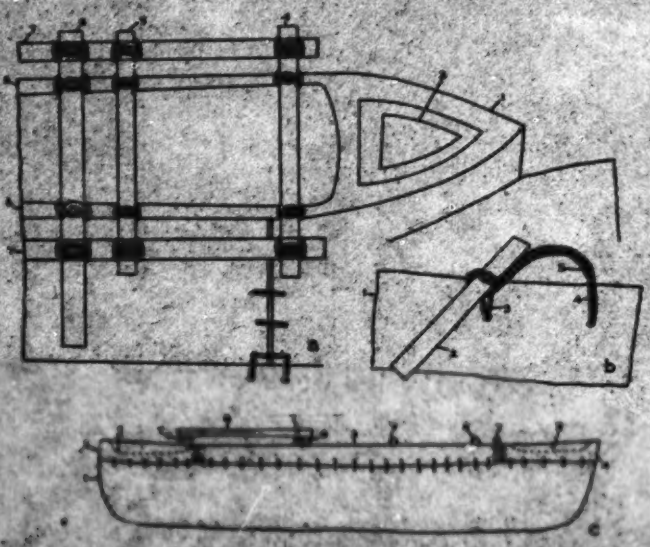

Figure 30.—Plank canoe. *a*, arrangement of lifting bars at stern of canoe; 1, raised bait deck (*waka-tuna* stage); 2, bait receptacle (*tuku pukapuka*); 3, washstrake of canoe; 4, cross lifting bar (*mano hi mua*); 5, second cross bar (*mano a lua*); 6, cross boom supporting outrigger float; 7, longitudinal members (*pukapuka kaupeyu*) lashed to cross members; lashings all of alternating curves pattern. *b*, lifting loops of sennit (*punga ihi*); 1, section of washstrake; 2, cross boom; 3, lashing of boom to strake; 4, four turns of sennit made through hole in strake and around lashing of boom to strake; 5, winding of these four turns, buried commencement and finish. *c*, near quarter; 1, outrigger hull; 2, stern cover (*papani hi mua*); 3, washstrake; 4, bow cover (*papani hi tuna*); 5, dotted lines show lowered bait decks in covers; 6, cross booms to outrigger float; 7, short lifting bars; 8, short longitudinal spars (*pukapuka kaupeyu*) forming lifting supports for stern of canoe.

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The *tai* shell canoe has (*a*)some advantages for reef work over the through and through lashed canoe because of the absence on the outside of the hull of lashings to be cut by sharp coral heads. It has the disadvantage, however, that the water seeps in through the hull joins and rots the wood about the joins of the hull sections. This seepage cannot be prevented by caulking as with the *nako tai nako* lashing. If a canoe is used much, the wood

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spar parallel to the customary longitudinal spar (*kiato*) lashed to the cross booms on the port side of the canoe. Informants also mentioned that formerly a big canoe made for fishing off the grounds by Tima Reef was fitted with two stern pieces (*vele*). The vele was cut from a single wide block of wood and two fish-tail ends were adzed out instead of one. This variation was characterized as a type of decoration (*uuka-uuka*) without utilitarian function.

One canoe in active use had attached to the hull only half of the customary two-piece bow cover. The fore part of the bow, usually covered by the *tuki*, was open, but the after part of the cover, the *puka*, complete with wave guard (*mataa puka*), was securely lashed to the hull. Informants remarked that this was an idiosyncrasy of the builder of the canoe. He had been faced by a shortage of wood during construction some years previously and had not since bothered to complete his canoe, but was on the contrary rather proud of its odd appearance.

Sails

Two types of sail, both said to be old, are in use today when canoes sail to the islets. The first is a triangular sail, *la mata keokeo* (*keokeo*, pointed); the second, a gaff sail, *la liaki o Te Palo*, named after the Yayake navigator who visited Pukapuka. Both types of sail were formerly made of pandanus (*laa uulu*) plaited in single element check (*langa tai*). The sail was made large enough to allow for an overlap which is basted over the sennit becket rope (*uuuuti ki lato o te la*) by which the sail is supported on the mast. (See figs. 31, 32.) The basting was done (*tui*) with pandanus material (*laa kie*) through holes made with a bone of the *akule* fish or a piece of *ngangie* wood. Sheets (*kapeapea*) of two-ply twisted sennit are fastened to the basket ropes by overhand knots.

Formerly the mast (*ulu la*) was made in two parts: a crotch (*uu aanga*) was lashed to the mast gain (fig. 31,b). The mast was raised by resting the crotch end on the forward cross beam (*kaukau ki mua*). Several turns of sennit were made around the beam to prevent the crotch from slipping sideways. Stays (*kaka*) supporting the mast are shown in figure 32.

The sail is supported by the top of the mast in one of three ways: the guy (*uuuuti*) by which the sail is hauled aloft may be passed through a hole (*pu*) bored through the top of the mast; the guy may be passed over a natural branch cleft (*uu aanga or kakau*) at the top of the mast and passed down to the canoe; the basket (*pu*) in the peak of the sail may be passed over the top of the mast before the mast is raised—the mast is thick enough at this end to prevent the basket from slipping down. The last method is used only in small canoes. In all three methods when the sail is aloft the guy is fastened to the port side of the forward outrigger boom.

Today, the mast is usually long enough to rest against the bottom of the canoe. It is lashed to the forward cross beam with figure-of-eight turns of heavy sennit, or else the guy passing from masthead to forward lifting bar is continued back to the cross beam to make several turns around both mast and cross beam. Ultra-modern Pukapukans either prop the mast in cup-shaped blocks cut out from the floor of the hull, or else bolt to the washstrakes planks with holes in them through which the mast is stepped.

The sail is further supported by a horizontal boom (*ulu lalo*) with a crotch at one end, resting against the bottom of the mast just above the lashing of mast to cross beam. The other end of the boom (*ulu ulu lalo*) is fastened to the gaff by a becket. A main sheet (*uuuuti*) of sennit is fastened by a sliding hitch to the boom from which it runs to

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the head of the sailor. When the canoe is sailing before a steady wind, the main sheet is fastened to a cross beam or lifting bar, or else it is gripped underneath the foot of the sailor.

At the inner, lower end of the sail the bucket rope passes from the sail and is now termed *sauli la*. It is fastened to the forward cross beam, or else its two ends are tied into a loop which is slipped over the crotch of the beam. Either method keeps the inner, lower end of the sail from ballying loose in a high wind.

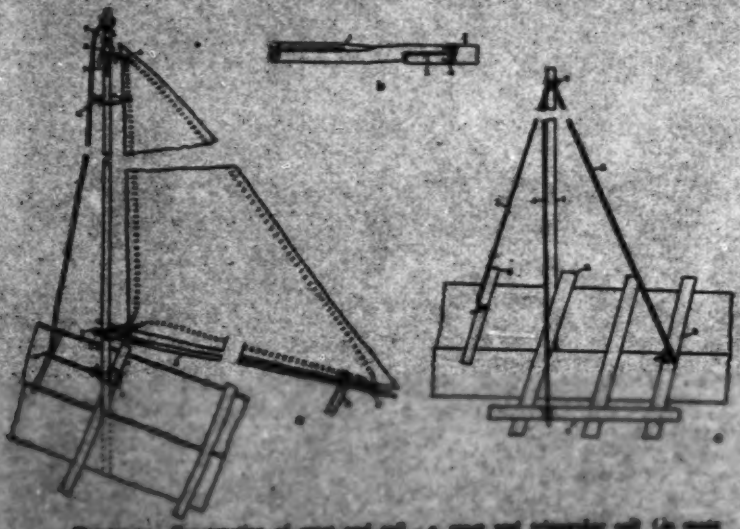

Figure 31.—Construction of mast and sail. a, mast and triangular sail (in main basket); 1, cross beam; 2, mast; 3 beam with crutch and resting against mast; 4, mast basket, hooked over end of beam; 5, inner basket crutch ends, fastened with overhand knot to long which passes over end of crutch to long sail mat; 6, sail basket, fastened to guy by overhand knot; 7, guy passes through hole in mast and down to cross beam where it fastens; 8, mast stays passing to other beams as shown in *c* below; third mast stay (9) passes down to forward lifting bar, makes two turns (10) around bar and passes again to cross beam to make two turns (11) around beam and mast, holding mast in place against beam; overhand knot finishes turns; 12, shore, fastened to basket crutch and to mast by overhand knot; 13, main shore, fastened to basket crutch by overhand knot and passes to outer ob. *b*, combination of crutch (for stanger) to mast spar; crutch (1) scarfed and fits against mast (2) cut to mast spar (3); commencement of diminutive lashing turns (4) which bind crutch and mast at apex; *c*, staying of mast: 1, mast outside basket of canoe, lashed to cross beam (2) (lashings not figured); 3, 4, 5, stays fastened to top of mast by clove hitch (6); 5, forward stay fastened to forward cross lifting bar (6); 4, stay fastened to longitudinal spar (7) aft of cross beam; 5, stay fastened to middle cross beam (8) as underscribed; stays fastened to beams by clove hitches; weight of sail, lifted by wind, provides counter-balance on weathered side of canoe to port side pull of mast.

1:Beaglehole and Beaglehole E-5 (1934-5)1938 Pukapukans

502 In a heavy wind, the mast of a triangular sail is kept vertical. To catch the greatest amount of moderate or light wind, it is hoisted over to an angle of about 30 degrees with the vertical. The boom runs from the mast at an angle of about 60 degrees, and the sail functions thus with its base upward and the apex down. This is the usual way of mounting the triangular sail.

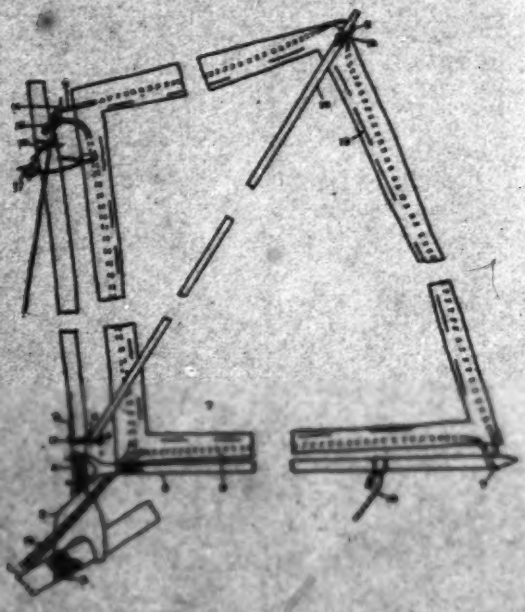

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PLATE 32.—Mast and gaff sail (*te Hahi a Te Pale*): 1, cross boom to outrigger, on which crutch (*tau vaenga*) (3) of mast (5) rests; 2, lashing on crossbar to prevent mast from slipping; 4, lashing binding crutch to mast spar (5); 6, boom with crotch resting against mast; 7, gaff sail; 8, basket summit lashed into overing of sail; 9, buckets which pass over end of supporting spars and keep sail taut; 10, sprit or gaff which extends outer peak of sail, resting at lower end in mortise (11) of summit made by taking down block around mast and tying free ends of summit in overhand knot; 12, upper end of sprit, basket prevented from sliding down spar by lashing sprit (10) taken around end of sprit; 13, heavy line indicates overing of overing to hold basket summit; 14, natural branch shaft (*mar vaenga*), over which basket loops when sail is hauled up by means of guy (15) fastened to basket by clove hitch; 16, stays run to bottom to support mast (see fig. 31, *c*); 17, sheet fastened to basket summit with overhand knot and looped around mast with double overhand knot; only one sheet shown, but average sail has about [illegible] sheets for mast and for boom; 18, main sheet, fastened to boom by clove hitch, runs to miller passed aft in canoe; 19, two ends of basket summit (*vaeli la*) pass to, and are fastened around, cross boom (3).

1:Beaglehole and Beaglehole E-5 (1934-5)1938 Pukapukans

226 lines are used for deep-sea fishing where both length and strength are desirable. These are made in three lengths, each from 50 to 75 fathoms long. The three lengths, called respectively *kawa lalo, kawa loto, kawa lunga* (sennit bottom, middle, top), are tied together with prominent knots. In paying out his line the fisherman feels the knots as the line runs through his hands to gauge the depth at which he is fishing, and is then able to fish at the depth at which he believes the particular fish bite best. Anchor lines of thick three-ply sennit braid are in continual use for deep-sea fishing. For tiny fish such as *lupo* a line of single pieces of coconut fiber is used with a gorge of pandanus spine.

227 184 One such line (C8043) wound round a wooden holder consists of 34 lengths of coconut fiber, each about 10 inches long, knotted together; the line is finished with one length of very fine two-ply twisted *sau* and a snood of the finest single ply twisted *sau*, total length being 30 feet.

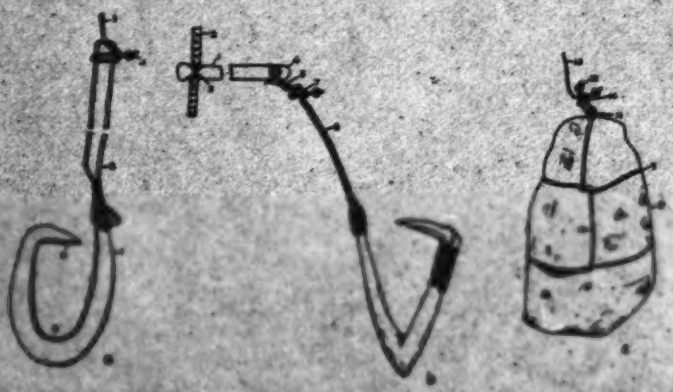

PLATE 35.—Fishing equipment. *a*, attachment of double snood to fishline (diagrammatically): looped double snood (2) lashed to shank of coconut-shell fishhook (1) with descending figure-of-eight turns; end of fishline (3) knotted (4); free end passed around loop and back on far side of loop, then over near side, through tip of loop and pulls tight. Coconut-shell hook (*tope ngatipa*) (C8188) 3⅛ inches high, 1¼ inches in greatest width with point-shank clearance of ¼ inch; head ⅝ inch wide, ⅜ inch thick; inner edges of point (3), head (6), and shank (1) bevelled slightly. *b*, composite fishing apparatus (*kawakawaho*) (C8150): spreader stick (1) attached to secondary snood (2); snood lashed with diagonal turns (3) of fine *sau*; at distal end of stick (4), short piece of *sau* (5) doubled and lashed to stick with transverse turns; snood (6) of hook is lashed to doubled *sau* (7); wooden hook (*hau*) small with short joint terminated. *c*, sinker for apparatus; sinker (8) block of coral (*punga*); one end of anchor line (9) makes two transverse turns around sinker, other end (10) caught by turns; at top, two free ends fasten with double overhand knot (11), then looped, and ends fastened again with overhand knot (12); sinker line grasper (13) from fishing apparatus knotted in loop (14).

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Secondary snoods (*matai*) are made of twisted sinnet. They are either single or double. Single snoods are fastened to fishline by knotting. Double snoods seem to be a feature of coconut-shell fishhooks. The attachment of these snoods to the fishline is shown in figure 33,*a*.

Many lines used in fishing from the beach (*wakanoa* system) are wound on a wooden holder (*muli pokai*), their hooks supported by floats.

Rods

For *haloma* fishing, reef and lagoon angling, and trolling with a composite pearl-shell hook, the fishing line is attached to a rod (*matila*). The total length of fishline attached to the rod is several feet longer than the amount of line necessary for a cast.

The fisherman judges the length necessary for a cast and makes at this point a clove hitch round the distal end of the rod. The free end of the attachment line he carries down the rod, making a single transverse turn with a single overhand knot round the rod at equal intervals. Toward the proximal end of the rod, he makes several transverse turns round the rod and fastens the free end of the line to the standing line with an overhand knot. For carrying to and from the fishing ground, the casting line with hook attached is laid along the rod, a transverse turn fixed with a single overhand knot is made round the rod toward the proximal end, and the free end of the casting line carried up the rod again; the hook is caught in one of the transverse turns made round the rod by the attachment line.

The *haloma* rod, *matila haloma* (CB137), is made of *puapua* wood, 4 feet 6 inches long, ¾ inch in diameter at the proximal end, ½ inch diameter at distal end. The line is very fine two-ply twisted sinnet (about the thickness of no. 50 cotton thread). The casting line is about 4 feet 6 inches long, the attachment line 14 inches long.

A larger fish rod for needle fish (*matila ʻi aheuka*) and reef fish is also made of *puapua* wood (CB138); it is 6 feet 9½ inches long, ¾ inch in diameter at the proximal end, ½ inch in diameter at the distal end. The line is fine two-ply twisted sinnet (about the thickness of coarse thread). The casting line is 10 feet long, the attachment line 3 feet long.

The attachment of bonito hook line to the bonito trolling rod (*matila atu*) is by a clove hitch to the distal end of the rod. Where more than one hook is attached to the same rod, the several clove hitches are fastened round the rod below each other (fig. 34,*a*). The bonito line, of thick three-ply twisted sinnet, is about 20 feet long and is attached to the rod at a point about 10 to 12 feet from the hook, depending on the length of casting line that the fisherman desires. The free end of the line is wound round the rod with oblique downward spiral transverse turns and tied about the middle of the rod with an overhand knot. The free ends of several attached hooks wound thus round the rod produce a pleasing pattern lashing on the rod.

The bonito rod is fitted into a wooden handle (*tukau*) which has an upper grooved part into which the proximal end of the rod fits, a raised flat projection (*matiro tukau*) covered with netting, and a handgrip (*muli tukau*) at the end. The shape of the handle and the method of lashing the rod are shown in figure 34,*b*. The completed lashing resembles the *sa-ʻafaiti* Samoan lashing of bonito rod to handle (27, p. 303) though the technique of lashing differs slightly.

The netting covering the flat projection above the handgrip is made by the ordinary netting technique and is fastened round the handle by transverse cords that pass through the marginal meshes above and below the projection. When lines and hooks are attached to the rod, the casting line is carried down the rod and the hooks caught through the

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netting meshes. For use, an appropriate hook is selected, disengaged from the netting meshes and allowed to hang free from the distal end of the rod. If fish do not bite this hook, it is replaced in the net and another hook disengaged. With six or more hooks attached to the rod at one time, the fisherman is able with maximum speed and minimum trouble to select the hook which the fish prefer to bite.

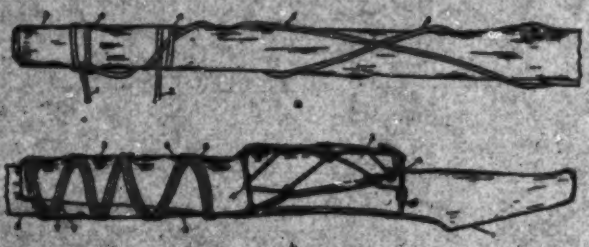

FIGURE 35.—Bonito rod. *a*, attachment of casting line: 1, 2, casting lines attach two hooks to distal end of rod (3); 4, clove hitches made around end of rod; casting lines hang free; attachment lines (5) wound spirally around rod and fastened halfway down rod. *b*, attachment to handle (*tuhau*), side view: 1, handle of *waikawau* wood with handgrip (*mauli tuhau*); 2, raised flat projection (*matar tuhau*); 3, hollowed out upper part; raised projection covered with netting (*epa*) fastened to handle by cords passing through marginal meshes (4); rod (5) pushed into hollowed upper part, chocked if necessary with small wedges of wood (6); lashing of three-ply braided sennit commences with buried end (7) at upper end of handle, then wound around handle and rod descending spirally, then up handle and rod ascending spirally; continues alternate spirals, descending and ascending, for three turns each way (8), and finishes with buried end (9).

Nooses

Nooseing apparatus consists of a line of three-ply twisted *wau* about 18 feet long and a stick (*kau*) by which the noose is brought near the fish.

The stick (Ch152) is of *pumpau* wood, 6 feet long, ¾ inch in diameter at the proximal end, ⅜ inch in diameter at the distal end (fig. 42*c*). The distal end is notched to provide a running groove for the line on which a running noose (*matapili*) is made with a slip noose (*matyi*). Line and handle together are termed *hangoio*.

Composite Fishing Apparatus

For deep-sea hand line fishing from a stationary canoe outside the reef (*tukumaoma* system), a composite fishing apparatus (*taumakomako*) consisting of a number of hooks attached to one line is used.

Of two types of *taumakomako* in use, one (Ch150) has a secondary snood (*matai kawa*) of three-ply sennit 6 feet 8 inches long. At a point 2 feet from the proximal end of this snood a *upangie* spreader stick, 5¼ inches long, ¾ inch in diameter, is lashed. The proximal end of the stick is grooved circumferentially and the snood fastened to the stick by four oblique transverse turns of fine two-ply twisted *wau*, followed by three circumferential turns between stick and snood, the finishing end being buried

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227 254 in three transverse turns round the snood (fig. 33*b*). Five spreader sticks 9 inches apart are attached to the snood in this way, being lashed so that the distal ends of the sticks project alternately to the left and to the right of the snood. The distal end of each spreader stick is also grooved circumferentially, and a length of twisted sinnet, 1¼ inches long, is doubled and the free ends fastened to the spreader stick groove by transverse turns of fine sinnet. To this double spreader stick snood, the fishhook snood proper is fastened by the method of knotting illustrated in figure 33*b*. Five fishhooks are attached to the five spreader sticks. By making these sticks project alternately to left and to right, the danger of tangling the hooks in use is avoided.

Informants mentioned another type of *tauanakoauako* formerly in use. It consisted of two crossed spreader sticks of *ngangie* wood, each stick about 18 inches long, with a cross section diameter of about 1¼ inches. To the ends of each spreader a snood was joined. The four snoods ranged in length from 2½ to 6 feet so that four fish caught on wooden hooks knotted to each snood would not tangle the snood lines. At the intersection of the spreaders, a sinker line (*kauaatau taku maena*), 12 inches long, was fastened to suspend the sinker (*maena*) of *fungo* coral. Also at the intersection of the spreaders was knotted a secondary snood (*matai*) 12 feet long. To the *matai* was fastened sennit fishline about 200 fathoms long.

Sinkers

For fishing at moderate depths of 50 or 75 fathoms, sinkers (*maena*) consist of any coral stones of suitable weight picked up on the beach. Because these sinkers are disengaged from the line and fall to the bottom when the hook has reached the required depth it is pointless to use any but rough stones. In *tukamoana* fishing, one sinker weighing about 9 pounds is used repeatedly. Even for this the Pukapukan fisherman has apparently felt no incentive to make well-shaped or bored sinkers. He chooses as a sinker stone a block of coral that is roughly rectangular or cone-shaped. If the surface is not rough enough to hold the sinker line without slipping, it is chipped slightly to form two transverse grooves into which the sinker line fits. This line is attached to the sinker by transverse turns and knotted to the secondary snood (see figure 33*c*).

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Fish Club

227 Fish clubs (*patu ika*) are made of *ngangie* wood; their size and weight depend on the fish which it is proposed to kill with them. A small club is used for *patuki* and other reef fish caught in reef angling or canoe fishing.

This club (Cl.163) is shaped like a small tuki pounder with a blunt proximal end. It is 16 inches long, 2 inches in diameter at the distal end, 1 inch in diameter at the proximal end. The distal end is slightly convex. The club weighs 1¼ pounds. Larger clubs weighing up to 5 pounds are used for larger deep-sea fish. Today a section of iron bar is often used as a fish club.

Hook Containers

[415] When not in use, small, valuable single and composite pearl-shell hooks are kept in the house stored in the double satchel (*tulowa pa*) described elsewhere (p. 134). Hooks and small fishing gear when taken into a canoe are kept for safety in a coconut-shell container (*pupu*).

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An example of this type of container (Cl93) is a smoothly polished coconut shell, the eye end of which has been cut off to make a container 4 inches high, 2½ inches in diameter at the mouth. The mouth is covered with another half coconut shell (*papani*), which fits tightly over the container.

Fishhook gorges used in fishing needle fish are kept when not in use by sliding them into a gorge cushion (*tupa aa*) which consists of a small cylindrical section of shaped coconut husk. The gorge cushion may itself be kept in the coconut container by the fisherman out in his canoe.

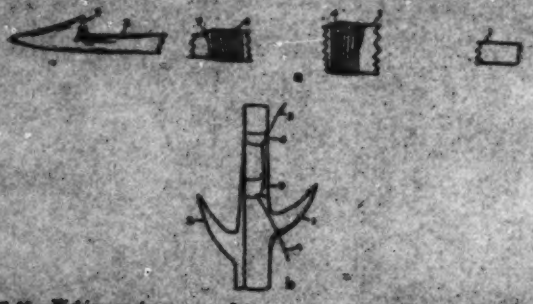

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FIGURE 35.—Fishing equipment. *a*, fish spear (*tao ika*) (Cl193): 1, shaft of *pouloa* wood 20 feet 3 inches long, diameter at proximal end (*matamuli*) ¾ inch, widest diameter of haft 1¼ inches; 2, 3, barb (*wakatala*) of *ngangie* wood, 1 foot 9 inches long, ¾ inch diameter; 2, point (*mata*) of barb 2 inches long, cut in ½ inch; sharpened stem of barb fitted (5) into pithy core of *pouloa* wood for 3 or more inches and held tight with 73 turns of two-ply twisted sennit (4); commencing and finishing ends buried; at point (5), observable projection above lashing of haft. Second fish spear, constituted in field, was one-piece point and haft of *ngangie* wood, 8 feet long; barb 6½ inches long; proximal end finished with small terminal knob. *b*, gorge of pandanus spine (*matatala*) (Cl943): 1, 2, two spines (thorns) stripped from pandanus leaf and glued together so that barbs project on either side; spines joined together by snood (3) of finest sinnet fiber with two pairs of half hitches (4, 5); 6, free end of snood serves as bait tying string (*tahale tuunga*); length of gorge ⅝ inch, width ⅛ inch.

FISH SPEAR

Most fish spears in use today are thin iron rods or wooden shafts with iron points. Formerly both shaft and barbed point were of wood. A typical spear is shown in figure 35*a*.

GORGES

Two types of gorge (*ao*) are in common use: one of fishbone is used for catching the needle fish; the other, of pandanus spine, is used for the tiny *hupe* fish.

The fishbone gorge is a bone of the same fish about 1 inch long. The snood of fine two-ply twisted sinnet (*tahale*) is fastened to the hook below the head by four half hitches (*tau palenga*). The free end of the snood serves as a bait string (*tahale tuunga*).

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227 A bait of *bolosus* flesh is wrapped round the bone and the bait fastened with several turns of the bait string. When not in use, the gorge is pushed into the gorge cushion. The gorge of pandanus spine (*matatolu vaela*) is described in figure 35,*b*.

Hooks

Pukapukan fishhooks are made of wood, coconut shell, pearl shell, and turtle shell. The generic name for a wooden hook is *kau*; for a shell hook, *patala* or *matau*; for a composite hook, *pa*. Single-piece hooks are further named according to their size and shape. The hook is conveniently divided into shank, bend, point limb, and point. The Pukapukan equivalents for these and other terms are shank or point limb, *kaukau*; outside of the bend, *mauli*; inner curve of bend, *liu*; point, *mata*; barb, *unhatala*; shank knob, *lake*; terminal or proximal end of shank above knob, *tifeo*.

227 284 In use, each hook has a snood (*take*) lashed to the proximal end of the shank. The end of the three-ply twisted or braided snood is unravelled and laid against the inner side of the shank knob with the end of the braided section resting against the proximal end of the shank. One ply is placed to the right; the other two plies, which are treated as a single element, to the left. The first ply is passed transversely round the shank to the right, under the knob on the outer side, then round to the inner side again to pass diagonally upward to the snood where the free end of the ply is laid against the braided portion of the snood. The other two unravelled plies pass to the left, transversely round the shank, under the knob but on top of the already wrapped first ply, round to the inner side of the shank to pass diagonally up to lie against the braided portion of the snood.

The lashing of snood wrapping to shank is done with braided sennit or *vaka* cord. The lashing pattern is figure-of-eight turns in which crossings are on the inner side of the shank and the loops are alternately above and below the shank knob. The figure-of-eight turns are either ascending or descending (*i alonga*) according to the choice of the worker. The Pukapukan lashing technique corresponds to that described for Manihiki (28, pp. 171-172, figs. 84, 85). In the ascending pattern lashing, the commencement end is buried and the free finishing end makes seizing turns round the snood to bind the unravelled ends of the snood securely to the length of the snood. The finishing end is buried under several of the transverse seizing turns. In the descending pattern lashing, the commencement end may be buried under seizing turns round snood and free snood ends before the figure-of-eight turns are commenced; the finishing end is buried beneath the last two descending turns. Alternately, the lashing commencement may be buried below the free coils of the snood, but after the lashing turns are completed, the free end of the lashing cord is carried up to the snood and the seizing turns made before the finishing end is buried. A third variation occurs when the wrapped unravelled snood plies are too short to lie against the snood; in this case, the commencement is below the snood, the finishing end is buried beneath the last two turns, and there is no need for seizing turns round snood.

The use of bait strings (*tahele maawa*) is a common feature of most hooks. If the buried end of the lashing cord is long enough, it is not cut off flush with the finishing turns, but is allowed to hang free. If the free end of the lashing cord is not long enough to serve as a bait string, an additional piece of fine cord is fastened to the bend of the hook with a slip knot. In use, the bait is laid on the hook and several turns are taken round bait and hook with the bait string.

k:Beaglehole and Beaglehole E-5 (1934-5)1938 Pukapukans

WOODEN HOOKS

227 Wooden hooks vary greatly in size according to the fish they are designed to catch. Small wooden hooks are used interchangeably with the single-piece pearl-shell hook (*tope*) for catching in deep water the smaller reef groupers. Large wooden hooks are used to catch *Ruvettus* and other large deep-sea fish. All wooden hooks are termed *kau*; the largest V-shaped hook is sometimes distinguished by the name *yemo*, the largest U-shaped hook by the name *youo*.

Wooden hooks are of two shapes, the U-shape and the V-shape. All the hooks are made from *ngangie* wood; most of them from forked branches, some of the U-shaped ones from branches that have been artificially bent and made to grow in this position. The hooks are two-piece, the point being fitted to the point limb with a lashed scarf join. The upper end of the shank is narrowed and provided with a shank knob to support the lashing of snood to shank.

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227 In larger hooks used for *Ruvettus* and other deep-sea fish, the lashing of point to point limb may be in two or three separate sections. This occurs in five of the eight deep-sea fishhooks available for study. The remaining three hooks are freshly lashed, probably by inexpert fishermen who knew that the hooks, intended for a museum collection, would never be used for fishing. The middle of three lashings is put on the smaller hooks about 1 inch below the head of the functional point, 2 or more inches below this point on larger hooks. After the transverse turns completing this lashing have been made, the lashing is covered by tough fish scales (*mauri*) of the *malatea* fish which project above and below the lashing. The ends that project below are caught with the transverse turns of the lowest lashing, those that project above are caught with the turns of the topmost lashing. The fish-scale covering protects the middle lashing from being destroyed by the biting teeth of a hooked fish. Because it is usual to protect only this middle lashing, one may assume that a hooked *Ruvettus*, for example, is expected to swallow a hook to the point where his jaws close on this middle lashing, not on the lowest or topmost lashing. The free end of the lowest lashing is carried up over the fish scale covering to commence the topmost lashing; even if this longitudinal thread is severed, the topmost lashing can not become unravelled because the free end is effectively buried in the descending turns. (See lashing in figure 37*d*.)

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The clearance between the point and the shank limb varies greatly among the hooks. In small wooden hooks the clearance ranges from 3/16 to 3/4 inch, in the larger hooks from 1 1/16 to 3 1/4 inches. Kennedy states that the required clearance is equivalent to the thickness of the edgewise thumb with the point against the middle of the nail (19, p. 17). Four out of 12 hooks have approximately this clearance, four small hooks have less than this clearance (about 1/16 inch), four large hooks have a much greater clearance (up to 3 3/4 inches). Leaving aside the four smallest hooks used to catch smaller deep-sea fish, I presume that four of the remaining eight wooden hooks used for large deep-sea fish were probably made for ordinary fishermen, the other four for expert fishermen who prefer the hook with the wide clearance. Both types of hook, those with wide and those with narrow clearance, were in common use.

In several of the hooks the point is directed away from the mesial longitudinal line of the shank limb. Presumably the explanation for this in the Pukapukan hooks is the same as that given by Kennedy for Ellice Islands hooks (19, p. 15), that is, the manner in which the scarf surface was cut on the point limb, previously with an adz, today with knife or saw.

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Of the V-shaped wooden hooks available for study, four are small hooks attached to the monitor-lizard apparatus used to catch small deep-water fish. (See figure 33, *b*.) These hooks are about 2¾ inches high (from the outside bottom of the bend to the top point of the shank) and 2¾ inches in greatest width (from outside of point limb to outside of shank limb). The clearance between functional point and shank limb is about ¾ inch. In two hooks, the shank leaves the point at an angle of 40 degrees; in the other two, at an angle of 45 degrees. In all four hooks, the snood is three-ply twisted sinnet cord which is attached to the shank by descending figure-of-eight lashings of fine sinnet cord. The free end of this lashing is carried up to the snood and seizes it with several transverse turns. The single lashing of point to point limb is by transverse turns with buried commencement and finishing ends. The lashing of a larger hook is shown in figure 36.

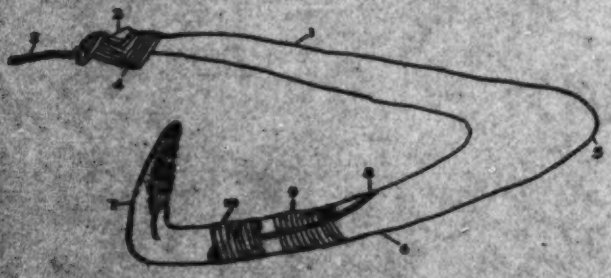

FIGURE 36.—Wooden hook (*hau*) of *ngaio* wood (C6526): hook 5 inches high, 2⅝ inches in greatest width, and ¾ inch clearance between point and shank; diameter of shank (1) above head ⅜ inch, thickness of bend (5) from outside bottom of curve to inner curve 1⅜ inches; angle of shank limb with point limb 50 degrees; snood (3) of three-ply sinnet braid attached to shank with descending figure-of-eight turns (4) around shank knob (2); point limb (6) and point (7) scarfed (8) and fastened with two separate lashings; lower lashing (9) made first with simple transverse turns, free end being carried up to commence second upper lashing (10); functional point (7) transversely convex on top, beveled underneath, and projects slightly downward. (Reproduced from Macgregor, 1st, fig. 7.)

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A larger V-shaped hook (*kaumoal pauru*) with a rounded and downward curving point is shown in figure 37*a*.

Between the V-shaped and the U-shaped hook may be distinguished an intermediate type of which there is one specimen for study (fig. 37*b*). This is an old hook which has been relashed. Owing to a natural twist in the shank limb, the top of the shank is turned out of the sagittal longitudinal plane running through the bend and point. It is this twist and not that of the point which makes the point appear to be directed away from the sagittal longitudinal line of the shank limb.

Of five U-shaped hooks, four appear to have been made from artificially bent wood, one from a forked branch that had a natural inner curve to the bend. The naturally curved hook is shown in figure 37*c*.

Of the three other U-shaped hooks, the smallest is 4¾ inches high, 3 inches in greatest width, ⅜ inch between point and shank; the second hook is 8¼ inches high, 4⅝ inches wide, 1⅝ inches between point and shank; the third hook (termed *pauru*) is 10½ inches high, 8 inches wide, and 3⅝ inches between point and shank.

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SINGLE-PIECE HOOKS

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Pearl-shell Hooks

Single-piece pearl-shell hooks are made in many sizes to catch all varieties of lagoon fish and most of the smaller deep-sea fish. The hooks are named according to their size and shape. For accurate classification, the name of the fish which the hook is made to catch is usually added to the type name

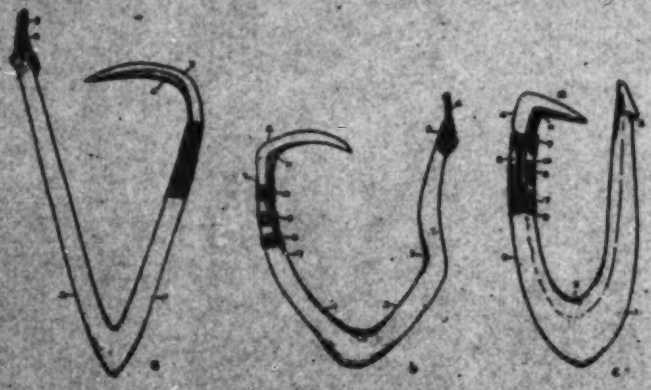

FIGURE 37.—Wooden fishhooks. *a*, large V-shaped hook (*ume*) of *aganga* wood (CB130): hook 13¼ inches high, 7 inches in greatest width, point-shank clearance 2¾ inches; diameter of point limb (1) and shank (2) above bend, ¾ inch; height from outside bottom of bend to inner curve, 1¾ inches; angle of point limb with shank limb 55 degrees; point limb and point (3) scarfed and lashed together with 30 turns of three-ply braided sennit; point flat on inner surface (4) and curves slightly downward; snood (5) of thick three-ply braided sennit attached to shank with descending figure-of-eight turns; free finishing end passes upward to eden snood (6). *b*, intermediate type wooden hook (*hau*) of *aganga* wood (CB126): hook 10 inches high, 6¾ inches at greatest width, point-shank clearance 2¾ inches; diameters of point limb (1) and shank (2) above bend, each 1 inch; thickness of bend about 1¾ inches; shank has inward bend (3), above which shank bends backward and away from medial longitudinal plane; snood (4) lashed with descending figure-of-eight turns (5); point (6) and point limb (1) scarfed (7) and fastened together with three separate lashings (8, 9, 10); point slightly flat on inner curve of bend (11), then curves up and down at point. *c*, narrow U-shaped wooden hook (*hau*) of *aganga* wood (CB112): hook 5⅜ inches high, greatest width 2¼ inches, point-shank clearance ⅛ inch; shank (1) ¾ inch diameter above bend, ¾ inch diameter immediately below shank knob (2); bend of hook (3) 1¾ inches high from outside bottom of curve to inner bend and 1 inch thick; point (4) lashed to point limb (5) with three separate lashings; middle lashing of six transverse turns (6) made first, lowest lashing (7) second, free end (8) carried over middle lashing to make top lashing (9); remains of fish-scale protective covering of middle lashing shown (10); point flat underneath (11), beveled on either side on top (12); distal end of point protects downward.

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227 of the hook. The hooks are made from black- or gold-lipped pearl shell and
254 provided with snoods of sinnet cord. They may be classified by shape into three types: a U-shaped hook, a circular hook that is usually barbed, and a slanted U-shaped hook that may be barbed.

Figure 38.—Shell fishhooks. *a*, pearl-shell hook (*yuki kakowa*) (Cb158): hook ⅝ inch high, ⅝ inch wide, and ⅛ inch thick; point (1) short, making point-shank clearance comparatively wide; inner and outer surfaces of point limb (2), bend (3), and shank (4) beveled; shank limb (5) flush with proximal end of shank; snood of three two-ply sinnet cord (6) fastened to shank by three transverse turns with free end of snood line which effectively holds snood fast to shank; finishing end (7) tucked under turns and held tight; hair string (not shown) of sinnet fiber wound around bend of hook. *b*, barbless, slanted U-hook (*tui wau*) of gold-lipped shell (Cb204): hook 1 inch high, ⅝ inch wide; edges beveled, but owing to irregular shape of shell, point directed away from marked longitudinal line of shank; point (1) bends slightly from point limb (2); wide point-shank clearance; snood (3) of wau cord fastened to shank by looking snood to its descending figure-of-eight turns, but very irregular (4) owing to fact that worker followed form laid upright. *c*, pearl-shell hook (*matasolo ni kakau*) for silvergrey (Cb164): hook 2 inches high, 1⅝ inches wide; edges beveled; point (1) bends slightly from point limb (2); barb (3) runs from point at acute angle, barb-point edge straight, beveled slightly; wide point-shank clearance; snood (4) of three-ply wau cord fastened to shank with descending figure-of-eight turns; finishing end of lashing sinnet snood for length of ⅜ inch at 5.

226 177 **U-shaped hooks.** Small U-shaped hooks (*yuki*) are used for bonito angling and for catching the smaller lagoon fish by other fishing methods.

An example of the *yuki* hook (fig. 38*a*) is minute and almost as wide as it is high. It was used for catching *kakowa* fish before European pins came into use. It is a beautifully made hook and shows craftsmanship of high order. The term *yuki* is applied to hooks of this general shape up to about 1 or 1½ inches high when the name *tafe* comes into use. *Tafe* hooks are U-shaped, but tend to be higher than they are wide. The name is also applied to hooks of other material such as turtle shell or coconut shell which have this general shape. The type *tafe* hook of pearl shell is shown in figure 39*a*. Other *tafe* hooks in the Bishop Museum collection range in height from 1⅛ to 1⅝ inches and in greatest outside width from 1 inch to 1⅝ inches. They are made of gold- or black-lipped shell; descending or ascending figure-of-eight lashings attach the snood of two- or three-ply wau cord to the shank of the hook. They are provided with hair strings.

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227 284 **Circular hooks.** Circular pearl-shell hooks (*maiau* and *wakavae*) are made with a barb (*wakatala*). Most of these hooks are as wide as they are high, but the size of the barb varies considerably (fig.39,*b*). In most hooks, the functional point is level with the lowest transverse turn of the snood lashing, directly opposite a point about 3/16 inch below the proximal end of the shank.

In one hook examined in the field, however, the inner curve of the hook was almost a perfect circle, the functional point being on a level with the top of the snood lashing and the proximal end of the shank. Another unusual feature observed on an old hook of this type was a pronounced terminal knob at the proximal end of the shank, separate from, and other than, the customary shank knob which was also cut on the outside of the shank.

a b

FIGURE 39.—One-piece shell hooks. *a*, U-shaped hook (*tepe*): greatest length 2 inches, greatest width 1⅝ inches, point-shank clearance ⅝ inch; *b*, circular hook (*maiau* or *wakavae*): greatest length 1⅝ inches, greatest width 1⅝ inches, point-shank clearance ⅜ inch; barb (*wakatala*) markedly concave and beveled; snood thick two-ply sinnet cord fastened to shank with descending figure-of-eight turns. 1, shank; 2, shank knob; 3, heel; 4, point limb; 5, point; 6, snood; 7, snood lashings; 8, barb. (Reproduced from Musgrave, III, fig. 4.)

226 176 There can be no doubt that the barbed hook is native to Pukapuka and antedates European influence. The first man to make the barbed hook is said to have been Te Upe, a man of Loto who lived in the reign of Maina, twelve generations ago. His name is mentioned in connection with barbed hooks in an old chant "Uku taku tangi". Beasley (4, p. 34, pls. XLIX A and XLIX B) figures six hooks of this type apparently collected by Gill prior to 1877. Beasley attributes the hooks to "Pukapuka, Penrhyn group", an evident mistake. The figured hooks range in height from 1½ to 2⅝ inches.

227 **Slanted-U hooks.** Slanted U-shaped hooks, large enough to be called *aukaolo* or *aukavae* and used for albacore fishing, have barbs. Small hooks of this type without barbs are called *tai uwe* (fig.38,*b*) and are used to catch the smaller reef fish.

These hooks are much higher than they are wide. The point limb is short compared with the length of the shank and the functional point bends only slightly from the plane of the point limb. The barb runs from the point at a very acute angle making a large point-shank clearance (fig. 38,*b*, *c*).

Despite a superficial similarity in shape of the hook shown in figure 38,*c* to European fishhooks, informants were positive that this type of barbed fishhook was native

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227 Pukapukan. Their contention is supported by the fact that Gill collected a hook of this shape before 1877. Beasley (4, p. 34) figures the hook in plate XLIX A, no. 2.
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Turtle-shell Hooks

Single-piece hooks of turtle shell are made in two shapes. One shape corresponds in all respects to the *tope*, U-shaped hook of pearl shell, and is used for the same fish as the pearl-shell *tope*. The hook of turtle shell is termed *tope unu*. A characteristic hook of this type (C8223) is 2 inches high, 1⅜ inches wide and has a uniform thickness of ¼ inch.

A smaller turtle-shell hook termed *kouilo* is used in fishing for lagoon fish with a line from the beach. The type hook is about ⅞ inch high, ¼ inch wide, ⅛ inch thick at the bend. The point-shank clearance is wide. Owing to the fine work necessary, the snood is attached to the shank only with three figure-of-eight turns.

Coconut-shell Hooks

Most hooks cut from coconut shell are made in the shape of the *tope* pearl-shell hook and are called *tope ngaipu*. They are used on the *taumako-mako* composite fishing apparatus and also singly in fishing for the smaller deep-sea fish outside the reef.

The hook is cut from the dry shell from the end opposite to the eyes. One side of the hook has the dark brown color of the outer surface of the coconut shell; the other side has the light brown color characteristic of the inner surface of the shell. The bends (fig. 33*a*) have a pronounced longitudinal convexity and a slight transverse convexity on the dark brown side. The edges forming the inner curve of the hooks are barbed slightly. The hooks have double or looped snoods attached to the shank.

A small hook (C8283) is 2¼ inches high, 1½ inches in greatest width; it has a point-shank clearance of ¼ inch. The inner curve is a pronounced U-shape, with a greatest inner width of 1 inch. The looped snood is attached to the shank with descending figure-of-eight turns, the finishing end being buried beneath the last two turns.

Composite Hooks

Composite pearl-shell or pearl-shell and turtle-shell hooks (*pa*) are used for trolling and for fishing reef fish. They fall naturally into two classes, the bonito hook (*pa atu*) and the small composite hook, distinguished from the bonito hook by the addition of the name of the fish caught with them to the generic word *pa*.

Bonito Hooks

The bonito hook is a two-piece hook consisting of shank (*pa*) and point (*manga*). The point is pierced with holes (*pu*) through which it is lashed to the distal (*muli*) end of the shank, along with the hackle (*wakamanua wao*). The line or snood (*taka* or *wakamaunga*) is passed through the proximal hole of the point, attached to the shank by a lashing that passes

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through a hole (*pu pa*) in the thick proximal end of the shank, and seized (*puliunga*) by a lashing thread (*alaala*) passing from the proximal hole of the point to the shank head. The distal end of the shank on the underneath side is cross-hatched (*katikoti*) to prevent the point-shank lashings from slipping, and filler sticks (*tua niu*), short pieces of coconut leaflet midrib, are pushed underneath the point-shank lashings on either side of the point base to steady the point on the shank.

The following description of the type Pukapukan bonito hook (fig. 40) is summarized from an examination of 28 Pukapukan bonito hooks, 11 of these in Bernice P. Bishop Museum, 17 in the field. Terminology employed for parts of the hook is that established by Buck. Lashings are described with the hook horizontal, point to the right, shank head to the left.

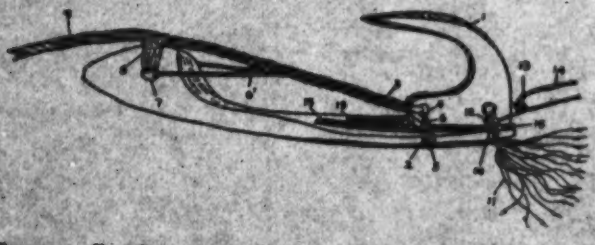

FIGURE 40.—Type Pukapukan bonito hook (C3188): point (1) of gold-lipped shell, beveled at functional point, bend, and outer angle; proximal lashing (2) and snood (3) pass through proximal hole (4); oblique lashing turns on back of shank (5); lashing thread (6), after overhand binding knot around proximal lashing, makes two turns through head hole (7) and proximal hole (4); after last turn through proximal hole, thread seizes snood (3) and its previous turns through head hole; lower threads occasionally left on for short distance and then included again in seizing of snood; toward head, lower threads (6') dropped and seizing continues to head hole; head lashing (8) consists of transverse turns around snood and through head hole, bound with circumferential turns; seizing of snood continues for about 1 inch above head hole (9); distal lashing (10) of point fixes hackle (11) with oblique transverse turns; half hitch binding (12) of distal lashing; thread passes around distal end of point; makes another binding around far side distal lashing, loop knotted (13) and cut to make secondary hackle (14); hackle (11) consists of number of fine threads of tuo; filler sticks (15) of coconut leaflet midrib pass under both lashings on near and far sides; shank 3¾ inches long; greatest width of head ⅝ inch, height of head ⅝ inch; width at tail ⅜ inch; thickness of tail ⅛ inch; length of filler sticks 1¾ and 1⅝ inches; length of point base ⅜ inch; thickness of point ¼ inch.

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The shank is made of strips of shell cut radially through the shell so as to include part of the hinge at one end. The shank length ranges from 3 to 4⅝ inches. The length of the hinge-head section in relation to the total length of the shank varies according to the size and thickness of the part of the shell from which the shank is cut. In the hooks examined, length of the hinge-head section of the hooks ranges from ¾ to 1 inches (fig. 41). The width of the tail end of the shanks ranges from ¼ to ⅝ inch, thickness from ⅛ to ⅛ inch.

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The nacreous inner surface of the shell forms the front of the shank, the rough outer surface of the shell, the back of the shank. The back is sometimes longitudinally flat, more often convex with a slight transverse convexity also. It is ground down to remove the dull rough material and to bring out a clear shiny iridescent or golden surface toward the distal end of the tail. Different surfaces are described in the ordinary color terms: *tua uelo toto*, a deep gold shank back; *tua 'kena*, a light iridescent color; *tua pula*, a pronounced rainbow iridescent color.

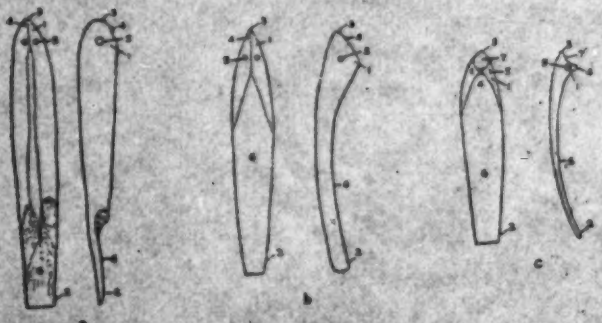

FIGURE 41.—Variation in bonito hook shanks, front and side views. *a*, long shank (C8216) with mesial ridge, slight grinding of head end, short tail section; *b*, type shank (C8187) with well-marked head, tail thicker than usual; *c*, small shank, head has short ridge caused by grinding of proximal end. 1, head; 2, tail; 3, head point; 4, mesial edge; 5, head hole; 6, front nacreous surface; 7, head point ground into concave surface.

A hole is bored transversely from side to side about midway down the thickness of the head. In one shank two such holes were bored, one at the extreme proximal end of the shank, the other nearer the maximum thickness of the head. Only the distal of the two holes carries the head snood lashing and it is evident that the proximal hole was bored by mistake too far back on the head to function properly.

The tails of the shanks are uniformly smooth on front, back, and lateral surfaces. In the opened grave (p. 164), however, Talainga saw a bonito shank that had two paired lateral projections at the tail end of a narrowing shank. He could give no information about the shape of the head of this shank, but the lateral projections are suggestive of similar projections on Melanesian hooks of the Solomon Islands. None could give any information about the shank type. All the hooks examined save one have a cross-hatching scratched on the back of the tail end of the shank.

The point of the bonito hook is shaped from shell cut from the lip edge of the pearl shell. One side shows the inner surface of the shell, the other side the black or gold outer surface which is smoothed down and sometimes polished. Eight points have been made of turtle shell, one of bone, the rest of pearl shell. In all the points the base is prolonged proximally to carry the technical head of the hook. In 26 points, two holes are drilled through the base of the point to carry the point-shank lashings; two points only have three holes. In none of the points has the proximal hole broken through the upper edge of the point base. Characteristic point shapes are shown in figure 42.

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The snood consists of three-ply twisted sea cord about 1/8 inch thick and 20 or more feet long. It is attached directly to the trolling rod without the mediation of a fishline

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proper (p. 188). It is lashed to the hook with fine two-ply twisted sinnet. The buckle is made of short lengths (1 to 1½ inches) of sinnet cord; the number of separate lengths ranges from 10, if of fine cord, to 28 lengths if of fine thread. Pukapukan fishermen have never used buckles of any material other than sinnet.

FIGURE 42.—Bonito hook points (*manga*). *a*, common shape, rounded back, point almost parallel with base line; *b*, another common point, similar to *a*, but with longer point base; *c*, point with square back, acute angle at top right edge of base; *d*, short functional point and base, wide bend; *e*, point with well-rounded bend, downward projecting functional point. 1, functional point; 2, bend; 3, base; 4, distal hole (*pu hi mua*); 5, proximal hole (*pu hi muri*).

No ceremonial is associated with the lashing together of the parts of the bonito hook. Considerable variation exists in lashing methods employed. Some fishermen employ separate lashings for the proximal and distal point holes in fastening point to shank, others employ a continuous lashing. The lashing of shank head to snood is also variable; some lashings consist of simple transverse turns, others of transverse and figure-of-eight turns.

A single hole lashing commences at the proximal hole with the middle of a long piece of thread. One end of the thread is left free to make the snood seizings, the other end is used to make transverse turns through the proximal hole of the point and round the shank. On the back of the shank, these turns make oblique crossings (*taukawiri*). On one hook only are the crossings parallel and not oblique. After six or eight transverse turns are made, they are bound on one side with the finishing end of the thread and fastened with overhand knots. On the other side, the free commencement end also binds the turns and is knotted, but the free end is passed backward and forward between the head hole and the proximal hole of the point for two or three turns and laid aside.

The snood is now laid on the front of the shank. One end of the snood is passed through the proximal hole of the point and doubled back along its length for the whole or part of the distance between point hole and head hole. The free end of the proximal hole lashing which has just made the turns between point hole and head hole is now seized round both the doubled snood and its previous turns through head hole with close turns. The point-head hole turns may be left out of the seizing for a few turns and then caught up again, or they may be continuously included in the seizing turns. In any case, toward the head, the point-head hole turns are dropped from the seizing which is continued to a point above the head hole. Most snood-head hole lashings consist of transverse turns between the hole and the snood followed by figure-of-eight turns over the snood, corresponding to the Manihiki method (29, p. 183, fig. 97).

[171]

With a separate length of thread transverse turns are made through the distal hole and round the tail of the shank, fixing the buckle in this lashing with oblique turns according to the Manihiki method (29, p. 179, fig. 91), with the exception, however, that the lashing thread, after making about ten oblique transverse turns, makes half hitch side bindings round the near side lashing of the distal hole. The free end of the thread is passed through the distal hole to the far side, again makes half hitch side bindings round the far side lashing. The free end is then brought back round the distal end of the point, passed under the near side lashing, up, back over it to make a distal point

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127 loop, and is finally fastened with overhand knots to this distal point loop. This loop
284 is stretched and knotted on itself with an overhand knot. The loop is cut below the knot and each end knotted again to prevent unravelling. This method of making the secondary hackle was the one illustrated to me, but it is possible that the Samoan method (27, p. 500) is also employed.

[171] If the base of the point is narrow and the point, after lashing, appears to be loose, filler sticks, ranging from 1 to 2¼ inches long, are inserted between the point base and the point-shank lashings to fill this space and tighten up the point. They are used in 17 hooks, absent in 11 hooks.

Variations on type hook. The previous description summarizes the type bonito hook. Variations, especially in lashings, are common.

Continuous lashing of the two point holes to the shank is done with a very long lashing thread. The worker measures this into three sections. Commencing with the middle section, he lashes the proximal hole with transverse, oblique turns, binds this lashing with half hitches and passes one end of the thread up to the head hole. The head hole-point turns may be simple turns passing from the near side proximal point hole to the near side head hole, through the head hole and back to the far side point hole, or they may be oblique figure-of-eight turns, passing from the near side point hole to the far side head hole, through this hole and back to the far side point hole. In either case, after finally passing through the point hole, the seizing of the head hole-point turns continues as before. When the lashing of the snood to the head is completed, the free end of the third section of lashing thread is passed along the base of the point to the distal hole and completes the distal hole lashing, hackle fixation, and secondary hackle as before. Alternately, in one hook, the free end passes through the proximal hole, to the far side, makes a half hitch side binding, then passes back to the near side distal hole between the base of the point and the front of the shank.

The turns between head hole and point in one hook are made by passing the lashing thread from the near side proximal hole of the point up to the head hole, down to the point again, round the far side proximal hole lashing at the side of the point base, up to the head hole, through this, down the near side and round the near side proximal hole lashing. This is continued for the customary three turns and the free end continues with the snood seizing. In yet another hook, the turns between head hole and point have been added after the snood was lashed to the head and instead of passing through the head hole, pass round the head snood lashing between the snood and the head of the shank. The third downward turn on the near side passes obliquely underneath the snood to the far side proximal hole and through this hole to the near side to complete the lashing.

Several hooks have a simpler lashing of snood to the head of the shank. The thread makes transverse turns through the head hole and over the snood, binding these turns with circumferential turns between the head of the shank and the snood. This lashing corresponds to the simple Marshall technique (29, p. 183, fig. 96).

[171] Most side bindings of point lashings are made with the regular lashing thread. In one hook, however, this is done with a separate short length of thread. The commencement end of this thread is knotted round the near side distal point hole lashing, passes to the near side proximal hole lashing, makes one turn round this, is then pushed through the proximal hole to the far side, binds the far side proximal hole lashing with one turn and passes down to the far side distal hole lashing round which it is knotted.

All but three hooks have the secondary hackle. One has nothing to take the place of this hackle. The second has a thread about 3 inches long knotted an inch from one end round the near side distal hole lashing, the two ends of the thread serving as a sort of secondary hackle. On the far side distal hole lashing, the finishing end of the thread lashing, after being knotted round the distal lashing, is cut off about 1½ inches from

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227 284 the lashing and serves as a single secondary hackle for the distal side. The third hook has on the near side a length of thread which is knotted round the proximal hole lashing and the free end of which passes to the distal hole lashing on the same side, is knotted round this and cut off about 1¼ inches from the distal lashing. On the far side, a thread was probably fastened in a similar way, but has been subsequently broken.

227 284 171 Two of the 28 hooks have points with three holes. Informants suggested that both of these hooks showed Manihiki influence. One of them was made by a Manihiki man long resident in Pukapuka and is one of the hooks with the exceptional secondary hackle. The snood is passed through the middle hole, turns between proximal hole and head hole are added as is customary with Pukapukan hooks, and the snood is seized as far as the head with turns that pick up and drop these head turns. The proximal hole lashing passes over the snood loop. The attachment of the snood to the middle hole is the attachment described by Buck (29, p. 177, fig. 89,*e*), and was done presumably for the same reason Buck gives; that is, because of the position of the holes—the middle hole being very close to the distal hole, the snood is passed through the middle instead of the proximal hole, to prevent the point lashings from being too close together. The addition to this hook of the Pukapukan method of seizing the snood presents an interestingly lashed hook which shows characteristic lashing patterns of two atoll cultures fused in the one object and illustrates also the importance of the personality of the fisherman in initiating new features. The hook has no filler sticks.

In the second hook with three point holes, the snood is passed through the proximal hole, the point lashings through the middle and distal holes. The hook is otherwise lashed according to Pukapukan technique and has filler sticks.

227 284 **Winding of snood.** After use, the bonito hook and snood are detached from the bonito rod and soaked in fresh water to wash out the salt from cord and lashings. The hooks are hung to dry in the shade. The snoods are then wound in a characteristic way.

Commencing about 5 inches from the head of the shank, the snood is wound transversely in longitudinal lengths round the fingers of one hand. When the winding has reached a point about 12 inches from the free end of the snood, the lengths are slipped from the fingers and passed over the point of the hook so that they lie along the front of the shank above the seized part of the snood. The free end of the snood is then passed transversely round shank and snood lengths about the middle point of the shank and the finishing end fastened to the last transverse turn with half hitches or overhand knots. The compact bundle of hook and snood is then placed away in safety until it is required again.

227 171 114 **Summary.** The Pukapukan bonito hook shows a number of constant features which make it a typical example of the western Polynesian bonito hook class as regards both type of point and the attachment of the snood to the point. Examination of a number of hooks reenforces conclusions drawn by Buck from a comparative study of bonito hooks (29, pp. 187-194). Pukapukan variations on the type pattern, while interesting in themselves, merely accentuate constant features of this pattern.

Macgregor (20, pp. 30-31), from an examination of eight bonito hooks in Bernice P. Bishop Museum attributed to Pukapuka, states that Pukapukan hooks "have features other than the snood attachment which make the two types [of eastern and western Polynesian bonito hooks] more diverse than Buck's classification suggests." Macgregor proceeded on the basis of his Pukapukan hooks to make a subdivision in the western group between purely western (Samoa to Pukapuka) and marginal western (presum-

7 [See 2; McGregor-- analyst.]

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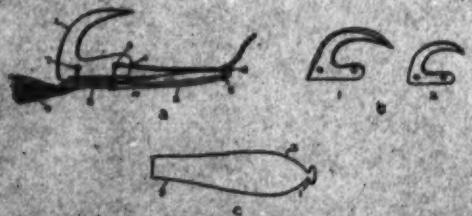
227 ably Pukapuka, also Manihiki, Rakahanga, Pagatau). It is unfortunate, however, that
121 of the eight hooks on which this newer division is based, four only are Pukapukan, the
114 remaining four hooks being typical Manihiki hooks. Informants were at great pains to make the point clear that Manihiki hooks attributed to Pukapuka were not authentically Pukapukan even if they were procured from a Manihikian man on Pukapuka. In any case they felt that the collector had become confused in his localities and had mislabeled hooks actually procured from Manihiki. Examination of the series of 28 bonito hooks indicates clearly that all but two of these conform to one general type and that the remaining two definitely show Manihiki influence. Hence one may conclude that Macgregor's analysis was based on an unfortunate mislabeling of museum specimens which invalidates his whole argument and indicates that Buck's analysis may still be taken as final.

Two old Pukapukan bonito hooks are figured in the literature: one collected by Gill before 1877 and shown by Beasley (4, pl. XLIX A, 1), a hook with a pearl-shell shank and turtle-shell point, apparently conforming in all particulars to the type Pukapukan hook. A second hook figured by Edge-Partington (8, 1st ser., pl. 62, 4) is also a typical Pukapukan hook. These hooks help to establish the stability of the Pukapukan type.

Small Composite Hooks

227 Small composite trolling hooks (*pa*) are made with pearl-shell shanks and turtle-shell points (fig.43,*a*). Hooks with shanks from 2 to 2½ inches long are used in trolling for *komuli* fish and are named generically *pa taki komuli*. Smaller hooks, with shanks from 1 to 1¼ inches long, are used for *malau* fish and are termed *pa malau*.



227 284 FIGURE 43.—Small trolling hook (*pa taki komuli*) (C8133). *a*, composite hook: point (1) first lashed to shank (2) through proximal hole (3); snood (4) passed through proximal hole and seized with free end of proximal hole lashings; seizing continues until head is reached when thread makes transverse turns (5) around shank and binds them with circumferential turns (6), then seizes snood for about 1 inch beyond head; distal hole (7) of point lashed, crossmeeting with thread passing from proximal hole underneath shank (8) across to distal hole on far side, thence back through distal hole and around shank to fix hackle (9) of tree fiber with oblique turns; no secondary hackle on this hook; filler sticks (10) inserted between lashings and sides of point base. *b*, small trolling hook points of turtle shell: 1, large point, beveled edges, rounded bend, and inverted functional point; 2, small point, rounded bend, short inverted functional point. *c*, pearl-shell shank: 1, notched projecting head; 2, widest part; 3, tail.

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227 Shanks of these hooks are of uniform thickness. They do not have the raised head of the bonito shank. Instead, the head consists of a notched projection (*malimali*). The shank widens below the head, then narrows and flares slightly to form the tail (*ʻiʻo*; fig. 432*c*). The greatest width of the shank in larger hooks is about ⅝ inch, in smaller hooks about ⅜ inch; the width of the tail in larger hooks is about ¾ inch, in smaller hooks about ½ inch; average thickness of all hooks is about ⅛ inch.

Shanks are made of both black-lipped and gold-lipped shell. The inner nacreous surface of the shell forms the front of the shank; the outer rough surface, the back of the shank. This rough surface is smoothed and polished, but the black surface is not ground away as in bonito hooks.

[321] All points are of turtle shell. Characteristic shapes are shown in figure 432*b*. The points range from ⅜ to ¾ inch in base length and from *a* to ⅛ inch in thickness. Two holes only are bored through the base; none of these was broken in the eleven hooks examined.

227 The lashing together of the small composite hook corresponds exactly to
284 the method described for the larger bonito hook.

A typical lashing is shown in figure 432*d*. Lashing of point to tail of the shank may be with a single thread for each hole or with a continuous thread. After the proximal hole is lashed with transverse turns which cross obliquely on the back of the shank, the free end of the thread seizes the snood as far as the head of the shank. In these small composite hooks, no thread is run between proximal hole and the head of the shank. The distal lashing is often bound at the side with the finishing thread to make the characteristic secondary hackle of the bonito hook.

Several slight variations may be noted on this fundamental lashing pattern:

Filler sticks are not used in six out of eleven hooks; in three, the filler sticks are outrunners midrib and in two the fillers are short fishbones wedged between the distal lashing and the side of the point base. In one hook, the point is lashed with a continuous thread which commences with the proximal hole. A half hitch side binding is made round the far side proximal hole lashing and the free end of the thread is passed underneath and diagonally across the back of the shank, then up to the near side distal hole to commence the lashing of this hole. In a second hook, the proximal hole lashing is completed and the lashing bound on the near side; the free end of the thread is then passed on the near side to the distal hole to make the distal hole lashing. The snood is passed through the proximal hole, but it is seized with a special lashing thread that is knotted round the far side proximal hole lashing, passes from this through the snood loop, and commences the seizing of the snood on the near side.

Secondary hackles are found on four out of eleven hooks. In two hooks the hackle is made according to the bonito hook pattern. In the remaining three hooks, it is made in slightly different fashion. In the first hook, the near side distal hole lashing is bound with the free finishing end of the lashing thread and the thread is cut about 1 inch from the distal hole. At the far side of the distal hole a thread about 2 inches long is passed through, up, back over the distal hole lashing. In one hook, the two free ends of this thread are twisted together and are knotted with the free end of the projecting finishing thread from the near side hole. In the second hook, the two free ends are tied in a double overhand knot effectively binding the far side distal lashing, and these two ends, together with the free finishing end from the near side, are knotted together to form the secondary hackle. In the third hook, both near side proximal and distal hole lashings are bound with a separate thread that is knotted round proximal side lashing, passes to distal lashing, is knotted round this, and passes again beyond the distal end of the point base where it is knotted with the double ends of a second thread that has been knotted round the far side distal hole lashing.

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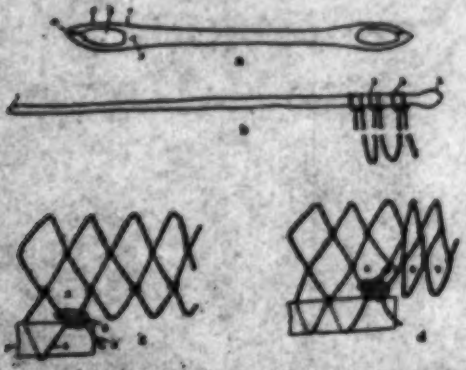
227 284 In one hank only does the gain linking commence with the distal hole. Transverse oblique turns fix the buckle, and the linking is bound with the finishing end of the linking thread, which passes round the linking and is knotted on itself. The commencement and end of the opposite linking thread for the proximal hole is knotted to the outer side distal linking and serves as a binder for this linking. The free end passes to the proximal hole on the inner side and makes four transverse oblique turns through this hole and round the shank. When these turns are completed, the free end passes up to enter the mesh, before the mesh to the head of the shank, and again seizes the mesh for about ½ hole beyond the head linking.



227 281 FIGURE 42—Netting needles and netting technique. *a*, netting needle (*umere*) of hardwood wood (*Cleidi*): needle 14¼ inches long; 1, expanded end ¾ inch wide; 2, mesh gauge (*pai*); 3, sides of slots (*manga*); 4, slit (*mere*) through which netting cord passes; 5, hole (*pu*) through which commencement and of netting cord knots; cord wound longitudinally between two slots. *b*, netting needle (*tai* or *puki*) (*Cleop*) of cocoanut midrib: needle 6¼ inches long, about ½ inch diameter; 1, blunt end; 2, terminal knob; proximal end (3) slightly notched (*makakiere*) and three lengths of small cord attached by clove hitches; when loaded, needle carries 10 or more lengths of netting cord attached to proximal end. *c*, netting technique: to make mesh by ordinary technique, mesh gauge (1) is placed in position so that upper edge touches completed mesh (2); netting cord (3) brought down behind gauge and up around lower edge to form loop (4); needle passes through loop of mesh (5), crossing drawn taut on upper edge of gauge where it is held with left thumb while netting knot (6) is made. *d*, to narrow net, same technique followed, but two completed meshes (6,7) brought together by superimposing 7 over 6 with netting knot made as before; in procedure, meshes 6, 7, 8, 9 would be brought together by superimposing 7 over 6, 8 over 7, and 9 over 8, with netting knot made around all four gathered meshes (only two superimposed meshes are shown).

Materials

Nets are made from two-ply twisted sinnet fiber, two-ply twisted sennit (*ulu*), and from fibers prepared from the aerial roots of the *pulu* pandanus tree. The methods of preparing these netting cords are described on page 143.

hL [See category 283 or 116— analyst.]

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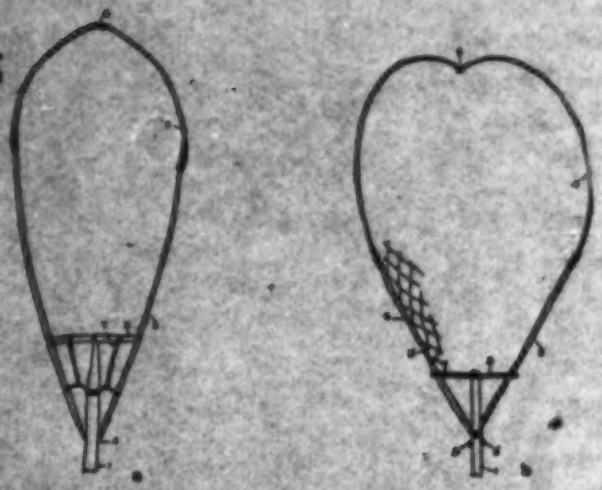

FIGURE 45.—Flying-fish and bird nets. *a*, framework of flying-fish net (*tau matolo*) (Ch167): 1, handle (*kaetia*) of *pwapwa* wood, 7 feet 2 inches long, greatest diameter 1½ inches, diameter at crossbar ¾ inch; head of handle slotted (*olopo*) to hold crossbar (*teba*) of *wakwaca* wood (2) which is 10½ inches long, ¾ inch in diameter; crossbar slotted at ends to receive rods (*nangowanga*) of pandanus wood (3) 3 feet long and ½ inch in diameter at ends where they fit against handle (4); other ends of rods are ½ inch in diameter and are joined to lighter rods (*matai*) (5) of *lakau yili* by scarf joins; each *matai* is 20 inches long and ¾ inch in diameter; the other two ends of two *matai* are notched, brought closely together (6) and joined by continuous transverse turns of cord; lashing of crossbar to handle strengthened by supernumerary lashings (7). The lashing of stout rods (*nangotonga*) to handle, shown in figure 46, *a*, *b*, *c*; lashing of head of handle to crossbar and of ends of crossbar to stout rods is in common alternating curves pattern; lashing of stout rods to lighter rods is by transverse turns around scarf join, commencement ends and finishing ends being buried. The supernumerary lashing consists of transverse turns around handle and across to stout rods on either side, then transverse turns around cross lashing and crossbar; cross turns and supernumerary turns are seized to make lashing taut. Net is 18 inches deep, with greatest width at mouth 19 inches. *b*, bird net (*tau ata*) (Ch143): 1, handle of *pwapwa* wood 10 feet long, 1¼ inches at widest diameter, and 1 inch in diameter at head; 2, crossbar of *ngangie* wood is 11½ inches long, ½ inch in diameter; 3, 3', stout rods of pandanus wood, 2 feet 6 inches long, ¼ inch in diameter; 4, lighter rods of *lakau yili* wood, 3 feet long, ¼ inch in diameter at join with stout rods, ⅛ inch in diameter at distal point (5) of frame; in attaching frame to handle, crossbar (2) is first lashed to upper side of handle; both stout rods (3, 3') laid over upper sides of crossbar and under handle, two ends of rods projecting slightly beyond handle, 3' to right, 3 to left; lashing of rods to handle, of rods to crossbar ends, and of crossbar to head of handle are all of alternate curves pattern; crossbar first lashed to head of handle; free end of cord carried to left end of crossbar and lashes end to crossbar; free end carried back across crossbar to opposite end of crossbar and

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223 lashes rod to crossbar end; free end of cord carried down to handle and lashes ends of
284 rods of handle; finally, free end of cord carried down handle, making transverse turns around handle at intervals of 15 inches; 4 feet from proximal end of handle, cord makes 8 transverse turns around handle and fastens with overhand knot. This lashing enables the bird catcher more quickly to draw in his net by providing a firm hold for his hands. Light rods (4) attached to stout rods (3, 3') by scarf joins lashed with transverse turns on one side and oblique transverse turns on the other; two ends of light rods overlap (5) and are fastened together; natural springiness of thin rods makes net framework heart-shaped. Net attached to handle before ends of light rods are lashed together; each rod passes through marginal meshes (6) of net, net being attached directly and without use of marginal cord; proximal end meshes of net are gathered on a double cord which loops loosely around head of handle below crossbar and has two ends knotted together. Net is 29 inches deep; greatest width at mouth 31 inches.

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171 Netting needles (*tui* or *uuuu*) and mesh gauges (*yiko*) are used. Of two types of
227 needle, the *uuuu* type (fig. 44,*a*) is similar to those used in other parts of Polynesia.
286 One end of the netting cord is passed through the hole and knotted. The rest of the cord is wound longitudinally between the two slots; the knotted end prevents the cord from slipping off the needle when only a few longitudinal turns remain on it. The second type of netting needle (*tui* or *yuki*, fig. 44,*b*) is loaded by making a clove hitch on it at the point of the notch and just forward of the terminal knob (which prevents the clove hitch from slipping off the needle) with the free end of the netting cord. A length of about 30 inches is measured off and another clove hitch made round the needle. This process is repeated until a sufficient length of cord is attached to the needle, hanging from the terminal knob end in double lengths of about 15 inches. In using the needle, a double length of cord is slipped from the blunt point of the needle. When this length has been used up, a second length is slipped from the needle and the process is repeated as the netting advances. In slipping the cord from the needle, the clove hitch in the cord unties itself. Needles are made in various sizes to suit different sized meshes.

The *yiko* gauge is a flat rectangular piece of wood scraped smoothly or a piece of turtle shell. A mesh gauge of turtle shell (C8131), used to make the flying-fish net in the museum collection is 3½ inches long, ¾ inch wide and ⅛ inch thick. The edges are polished smooth. Mesh gauges are of different sizes according to the size of mesh required.

TECHNIQUE

171 To make a net is *tui te kupenga*; a mesh is *mata kupenga*. The Puka-
227 pukan technique of netting (fig. 44, *c*) corresponds to the Samoan method
286 described by Buck (27, pp. 470-472) with one variation.

The netting needle is loaded and the required mesh gauge selected. An assistant holds a light supporting rod of wood around which the first meshes are made, the assistant judging their size by eye. This variation on Samoan starting technique is the same as the Manihikian technique save that a supporting rod replaces the supporting cord used in Manihiki. (See 29, p. 161, fig. 73.) When the Pukapukan netter has made the first row of meshes he transfers these meshes from the rod to a supporting cord. The ends of the cord are knotted and the cord looped round a stick placed in the ground or else round the toe of the netter. As each row is completed, the net is turned and successive rows are added by the same technique.

One Pukapukan method of narrowing bag nets is by the addition of extra meshes, the common Polynesian technique. A second method is by making a netting knot round two or more meshes. Thus in the bird net and in the flying-fish net described below, the bottom of the net is narrowed by gathering together under the thumb four successive meshes and making the netting knot round these four meshes together (fig. 44,*d*). The

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171 method corresponds to the Samoan technique of "dropping meshes in the various rows" (27, p. 472): gathering together two or more meshes in one row to function as a single
227 mesh means that in the next row there will be fewer meshes with which to work, hence the technique is equivalent to dropping meshes from subsequent working rows.
286

TYPES OF NETS

The seine net (*kupenga*) and the large hand fishnet (*tae yoake*) have been
227 described (pp. 57-58). The flying-fish dip net (*tae mulolo*) consists of a long handle, a crossbar and framework (figs. 45,*a*, 46). Its use is described on
281 page 58.
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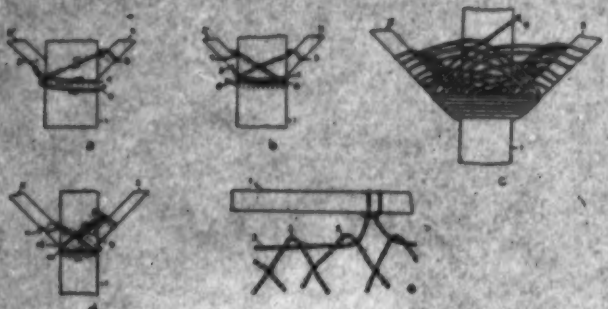

FIGURE 46.—Lashing of flying-fish net framework. *a*, commencement of lashing of stout rods (2, 2') to handle (1): commencement end of sennit cord (3) laid on far side of left rod; cord brought around in front of handle and transversely (4) around to back, across to far side, then up diagonally across near side, passing between rod (2) and handle, across front of rod (5), then diagonally down far side of handle, passing around and across front of handle (6). *b*, continuation of lashing: free end (6) passes to back of handle, diagonally up and across to rod (2'), around front of rod (7), behind it and diagonally down and across front of handle, and around back of handle (8); this establishes lashing pattern, which is continued for about 12 or more complete diagonal turns passing to each rod. *c*, completed lashing pattern is here shown with six turns only; *d*, on top of pattern are superimposed four superior diagonal lashing turns; method of making turns shown here (inferior lashings omitted); free end of cord (9) passes diagonally down far side of handle, around to front (10), across handle, diagonally up far side (11), around rod (2'), diagonally down near side, around far side of handle again, up diagonally across near side (12) to rod (2), around this rod and diagonally down across far side of handle; lashing pattern is continued until there are two diagonal lashings up and down handle; finishing end of cord carried diagonally across near side of handle to rod (2), makes two transverse turns around rod and buries finishing end underneath these two turns; finished lashing is of neat and pleasing design. *e*, attachment of flying-fish net to frame: 1, rod of framework; 2, marginal net meshes; 3, marginal cord passes through meshes, then up to frame, making a clove hitch around rod, passing down to pick up more marginal meshes; process continued until all marginal meshes are picked up on cord, rod clove hitches 6 to 8 inches apart, free ends of cord wound round handle just below cross-lashing holding suspensory lashing of crossbar to handle; second cord passes through marginal meshes at proximal end of net and is fastened to stout rods above lashing of crossbar.

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The flying-fish practice net (*tao penu*) used by young men to catch pandanus keys thrown at them in practice sport is of similar shape to the flying-fish net, but smaller.

It consists of a handle of *nonou* wood, 4 feet long and 1¼ inches in diameter, a crossbar 8 inches long, ¾ inch in diameter, and two stout rods of pandanus wood, 3 feet long, which are fastened to handle and crossbar, the ends bent close together and tied without the intermediary of lighter rods (*matai*) used in the flying-fish net frame. The lashings of framework and attachment of net to frame are similar to those of the flying-fish net. The practice net is made of the two-ply twisted fiber from the aerial roots of *yulo* pandanus. The net is 15 inches wide at the mouth, 18 inches deep.

The large bird net (*wuulo*, fig. 45,*b*) differs in shape from the flying-fish net.

The net framework is attached to the handle in such a way that the distal end of the framework rises at an obtuse angle from the plane of the handle. The distal point of the frame is 10 inches higher than the plane of the handle. The framework when viewed sideways presents the shape of an enlarged spatula. When the bird catcher brings down the net upon a flying or roosting bird, the net is reversed so that the distal end of the frame is lower than the plane of the handle. A bird flying from the net is more likely to be caught by the downward projecting spatula-shaped net than it would if the net frame were in the same plane as the handle. The frame and handle are made of light wood so that the net may be easily used in the tree tops. The net itself is made of fine two-ply twisted sennit.

TRAPS AND SNARES

Because the fauna of a coral atoll is extremely simple, there are in Pukapuka only two types of bird snare and a form of the widely distributed western Polynesian rat trap.

The construction and operation of the rat trap (*saka kiole*) are shown in figure 47. The trap is baited with mature coconut flesh (*ipiipi*) and set in a runway made by rats. The rat is removed by the owner of the trap, who resets the bait stick and spring mechanism.

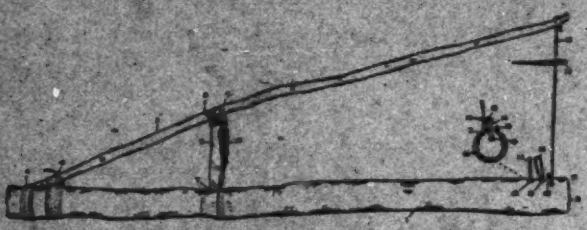
The coconut-shell bird snare (*maanga kui*) is shown in figure 48,*a*. Another bird snare (*maanga tuli*), shown in figure 48,*b*, is set on the beach, weighted down with stones, and the birds driven through it.

Though not strictly traps or snares, wooden structures (*fa uuma*) in which turtles are kept may be described in this context.

Stakes of *fanafua* or *puhuuna* wood, each about 5 feet long and 1 inch in diameter, are driven into the sea bottom a few yards from low water level of the beach. The stakes are arranged about 1 inch apart to form a rectangular enclosure 3 feet square, and 2 feet high. The stakes are bound together at top and bottom with horizontal poles and a continuous lashing which makes transverse turns round vertical and horizontal members. Baby turtles, caught as they emerge from their shells, are placed in these enclosures. They are fed regularly on squid and octopus until they are mature enough to be killed for a special food division. The size of enclosures observed varied according to the number of turtles placed within. An enclosure of the above size housed two turtles with shells about 12 inches long. Bigger structures contained five or more small

1-Beaglehole and Beaglehole E-5 (1934-5)1938 Pukapukans

125/231 turtles. There are about three of these enclosures in each village. When the people of Ngake go to Motu Ko for the copra-making season, they take with them their small turtles and put them in temporary enclosures erected on the lagoon frontage of the copra settlements.



227/284 FIGURE 47.—Rat trap (*vake hiole*) (CB171): trap (1) 2 feet 7½ inches long and 2½ inches in diameter at larger end, made of a section of pandanus wood, hollowed out at one end (2) into a hole 2 inches in diameter and 6 inches deep; a springy piece of *ngangie* wood (3) 2 feet 8 inches long and ½ inch in diameter tied to pandanus wood at one end (4) and supported by upright (5) 4½ inches high and ⅜ inch in diameter; lashing of spring to trap (4) consists of 7 turns of two-ply twisted sennit around end of spring and trap; free end of sennit carried 1 inch up spring to make eight figure-of-eight turns (6) around spring and trap; finishing end buried, but not cut off flush with previous turns; upright (5) rests at one end in a natural depression (7) on upper surface of trap; upper end lashed to spring with common alternate curves pattern lashing (8); suspensory brace (9) consists of 4 turns of two-ply twisted sennit around spring and trap, transverse turns being seized with 23 transverse turns (10) finished off with half hitches; on either side of middle line at open end of trap, holes large enough to allow rat of two-ply twisted sennit are bored through roof of trap just inside entrance (11); a little farther in, two holes (12, 13) are bored in median line; straight stick (14) pushed down through innermost hole (12) to support bait (19); loop of sennit (15) knotted inside trap so that it projects above trap to height of bait stick; length of sennit (16) knotted around free end of spring; after testing tension, a light stick (17) is fastened by clove hitches to sennit so that it passes through noose (15) and rests its pointed end on top of bait stick (14); end of sennit (16) pushed through hole (11), passed around inner circumference of trap hole, and pushed out through another hole where it knots (18); cross section shows sennit (16) passing around inner circumference of trap (2), knotted at 18, bait stick (14) baited (19), and light stick (17) passing through loop (15) and resting on top of bait stick (14); trap set by pulling down spring and passing stick (17), attached to sennit, through loop (15) and resting its point on upper end of bait stick (14) (see cross section). In this position, as long as upper end of bait stick remains immovable spring stick cannot fly back; sennit loop within trap spreads out so that a rat entering trap must step over loop to nibble at bait which is fastened to pointed end of bait stick before trap is set. Rat nibbling bait moves bait stick which releases light stick, spring flies up and catches rat against roof of tube by tightened loop. In use, trap is propped in position by stones and sand packed around and alongside it.

1:Beaglehole and Beaglehole E-5 (1934-5)1938 Pukapukans

Soul Trap

Though I believe the so-called "soul trap" was not used in Pukapukan culture but was only an ideological concept of one of the many traps with which the Underworld was full (p. 329), nevertheless particulars of the soul trap sold by Gill in 1876 to Sir Wollaston Franks for the British Museum may be given here. The following description as well as the print of the central portion of the trap (pl. 6) has been forwarded to me by Mr. Adrian Digby of the British Museum.

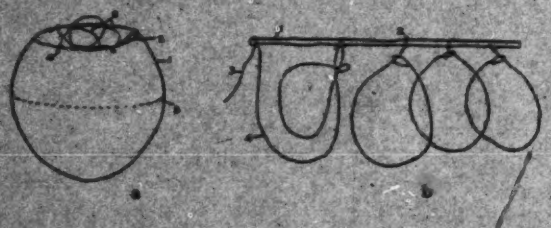


FIGURE 6.—Bird snares. *a*, snare for *hui* birds (*saenga hui*) (C8135): drinking nut (1) 4 inches high, with top removed to form opening (2) 3 inches in diameter; flesh removed from inside upper portion of nut down to dotted line (3); five holes bored through shell just below rim (4) and a length of prepared coconut fiber passes through each hole to be fastened by knot; free end of each fiber forms a slip noose (5); snare set by making five nooses which pass through each other and so block opening. *b*, snare (*saenga tuli*) (C8060) for *tuli* birds, section only of snare shown: stick (1) section of coconut midrib, 4 feet 4 inches long, ¾ inch in diameter; lengths of prepared coconut fiber (2) knotted at regular intervals along stick; fibers each knotted into slip nooses of which there are 23 on stick, each about 2½ inches in diameter; long fiber (3) with loop at end knotted to each end of stick and loop dropped over peg to anchor stick in place; a fixed loop (4) is knotted to each end of stick and placed over peg or held down with a stone to give more secure placement to snare; wings (*pa*) of coconut leaves and stones fan out at an angle of about 145 degrees from each end of stick to ensure that birds do not escape around ends of snare.

The trap (no. 3915, Christy Coll., British Mus.) has a total length of 19 feet 4½ inches and consists of eight loops (of which only six are shown in pl. 6) made by binding three-ply braid round a core. This core is made of double lengths of three-ply braided sennit, loose coconut fibers (probably those adhering to the roughly made sennit), and some two-ply twisted sago fiber. The loops are lashed in pairs to a long three-ply sennit braid which tapers at both ends. The shorter end (F) terminates in a two-ply twist about 2 inches long. The material used in lashing loops to the central cord is a combination of coarse three-ply braid, with either a fine three-ply braid or a two-ply twist. No details of the lashing are available. Mr. Digby suggests that part of the material used in lashing the pair of loops (D) is a small quantity of bark cloth. But bark cloth was never made in Pukapuka, and it is probable that the material has been confused either with coconut leaf stipule (*kaka*) which is not generally used for lashings because of the weakness of the fibers, or else with thick strips of sago fiber.

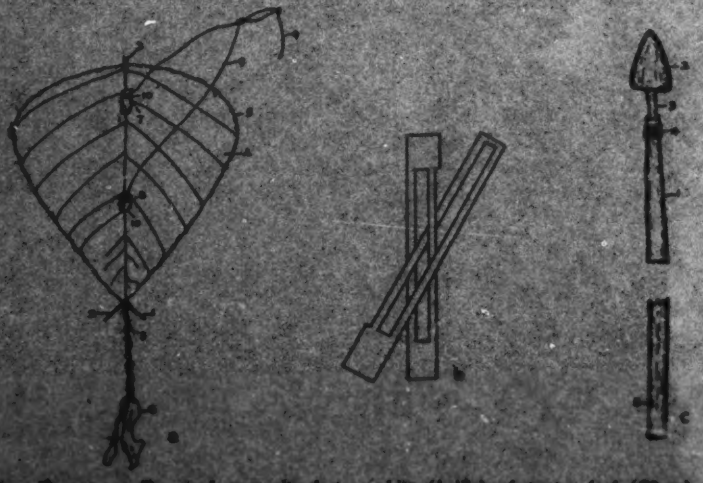
1:Beaglehole and Beaglehole E-5 (1934-5)1938 Pukapukans

524 Swings (*tākekeke*) are made by suspending a crossbar of *ngangie* wood by a sennit rope from a branch of convenient height. The swing is supposed to have been introduced originally by the voyager Wue on his return to Pukapuka. No skipping rope was known.

Noise makers (*pulaka manu*) are made by cutting shallow longitudinal slits on a length of *pulaka* stalk. The flanges so made are raised. With the stalk held in the left hand, the flanges are knocked down in succession with a sweeping blow of the dorsal side of the right hand. A loud noise results as each flange is leveled.

Pop guns (*manu*) are made by inserting a piston into the hollow core of a dry *ngaya* branch. The seed of the *tasyinu* tree or a piece of mature coconut flesh (*ipūpi*) is inserted into the branch and the piston sharply pushed down on top of the seed to produce a loud report. Another pop gun is made with the hollow wing bone of the *takupa* bird, a piston of *puapua* wood, and *tasyinu* seed or *ipūpi* to produce the report.

526 A surf board (*papa*) is any flat piece of wood of about an arm's length on which arms and chest are rested when surfing. No elaborate long boards are used, nor does the surfer ride in any position but the prone one.



524 284 Figure 42—Toys and composite dart. *a*, kite (*keke*) of *pupua* leaf (*Clappa*); coconut leaflet midrib (1, 2) bent into required shape and fastened to another midrib (3) by strips of coconut fiber (*kalasa*); edges of large *pupua* leaf (4) bent over this frame and fastened to it by continuous thread of fiber (5) which passes through leaf and around frame midrib; center midrib (2) extends below apex of kite and to this a tail (6) of two dried coconut leaves fastened by interwoven cords of fiber; *b*, type pukapuka

1:Beaglehole and Beaglehole E-5 (1934-8) 1938 Pukapukans

524 284 (7, 8), face of kite is punctured in longitudinal mesial line and a trailer cord (9) is knotted to midrib over small wads of leaves (10) which prevent chafing of kite face. Size of kite: greatest width, 10 inches; height, 10 inches; length of tail, 3 feet. A second kite (C8058) is 9 inches wide, 10½ inches high. *b*, trick figure of coconut leaflet (*tonga a Maui*): dried coconut leaflet 8 inches long, 1 inch wide slit three times longitudinally; section at each end of leaflet slit transversely so that leaflet consists of two sections, front and back, each bearing two thin strips; trick is to disengage two leaflet sections without breaking them. *c*, composite dart (*velo*) of *ngaiyu* wood (C8100): 1, haft 6 feet 2 inches long, average diameter ½ inch; 2, head (*ulutoo*) of *ngangie* wood 1¾ inches long, ¾ inch in diameter at base; 3, stem 1½ inches long, ¼ inch in diameter, pointed and driven into pithy core of haft and lashed with 10 transverse turns (4) of fine two-ply twisted *waa* cord; commencement and finishing ends buried; lashing holds *ulutoo* head fast and prevents haft head from splitting. Most darts also lashed with transverse turns at proximal (5) end (*yiku*) of haft to prevent splitting of haft when thrown dart strikes ground. Above described dart is small; a more typical dart, examined in the field, was 7 feet 6 inches long, ½ inch in cross section, with an *ulutoo* head 4½ inches long; butt end of dart was bound with *waa* cord.

524 Kites (*kolilo*) are made of a *puapua* leaf stretched over a coconut leaflet midrib frame (fig. 49, *a*). The tail (*kava*) is made of two dry coconut leaflets, the flying cord of strips of coconut midrib (*kalava*). A circular faced kite is termed *kolilo ipu*; a semi-diamond shaped kite is termed *kolilo kalawalava*.

The only tops in use are teetotum tops (*potshatoka*). These are *taupulepule* shells (*Conus ebraeus*) which are spun (*takavilivili*) with a twirl of the fingers. The spinning point is termed *mulimuli*, the spun end, *ulu*. No game is played with these tops; they are used as toys only.

526 Throwing discs (*potshatoka matu*) are made by rubbing down a piece of *punga* coral with another stone until the coral is roughly disc-shaped. Apparently no particular care is taken to produce a well-finished article. A rough disc seen in the field was 3¼ inches in diameter and between ¾ and 1 inch thick. To throw the disc is *nahapotshatoka* or *nakatatoka*.

Discs for the game of *tupe* are made of coconut shell. In a set of 12 (C8,94), five discs are cut from the eye end of the shell, seven from the opposite end of the shell. The discs range in weight from 1 to 1½ ounces and in diameter from 3 to 3¾ inches. No particular pains have been taken over the discs. The surface of the shell is smooth, but not polished.

The dart (*tika*) is made of *ngaiyu* wood:

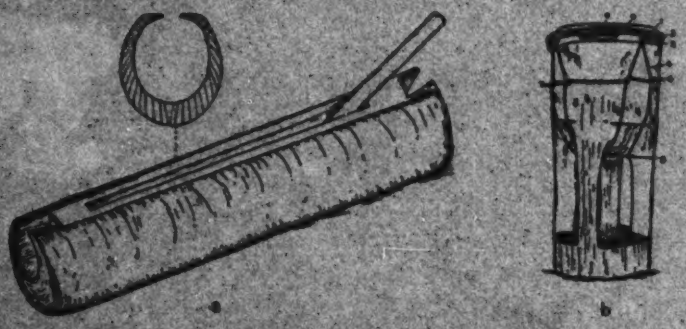
526 322 Lengths of wood are cut from the bush and heated over a fire so that the green bark may be easily peeled from the wood. The dart is rubbed smooth between two pieces of coconut shell. The shorter dart (*patika*, C8061) is about 2 feet long and ½ inch in diameter. The longer dart (*tika*, C8062) is about 8 inches longer and of the same diameter. The darts are bluntly pointed at the proximal end; the distal end (the head) of one of the darts has been worn away from striking the ground. It is a matter of choice whether the player uses the short or the long dart.

The composite dart (*velo*, C8100) is made of *ngaiyu* wood with a head (*ulu loo*) of *ngangie* wood (fig. 49, *c*):

1:Beaglehole and Beaglehole E-5 (1934-5)1938 Pukapukans

526 322 The wood is heated over a fire and the green bark peeled from it. The shaft is rubbed (*matumalu*) smooth between two pieces of coconut shell and given a deep brown color by hanging in the rafters of a cook house above the smoke of cooking fires. Alternately the shaft may be decorated with spiral lines by stripping the bark from the shaft in a spiral about 1 inch wide running from butt to head and then hung over a cooking fire for some days, after which the remainder of the bark is peeled off leaving the shaft with a spiral of dark brown running down the length. A dart decorated in this way is termed *velo lutu*.

411 Darts are used as sporting equipment today. Some informants suggested that *velo* with sharply pointed heads might also have been used as weapons.



534 284 FIGURE 30.—Gong and drum. *a*, wooden slit gong (C8111): diameter from slot to bottom 2¾ inches; cross section diameter 3½ by 4 inches; length of gong 17¾ inches; slot opening, 12 inches long, 1 inch wide; beating stick (C8112) 10 inches long, ¾ inch diameter. A second gong (C8054) is smaller: diameter from slot to bottom 2 inches; cross diameters 3 inches by 2¾ inches; length 16½ inches; slot opening 13 inches long; ¾ inch wide; beating stick (C8055) 12½ inches long, ¾ inch diameter. The wood from which gongs are made is *wetea*, that of beaters *ngongie*. Bottom surfaces of both gongs slightly convex. *b*, shark-skin covered drum (*paya*) (C8201): drum 2-feet 9½ inches high, 10 inches top diameter, 9 inches bottom diameter, cut from solid block of coconut wood; inside top of drum hollowed out and an edge ¾ inch wide and 2 inches deep cut around outside of top: 1, shark-skin cover (*mata hili mango*) laid on top of drum and circumference of skin folded over circular wooden binder (*tua kautaela*) of pandanus wood (2); skin shown cut away (8) to indicate wooden binder (9) beneath; 3, second wooden binder seized with three-ply sennit, placed on top of skin folded over first binder and pulled tight by three-ply sennit cord which starts as free end of seizing to second binder, passes down (4) around (5) one of legs (*vae*) and up again to second binder, under and over it and down again to second leg; lashing continues until second binder is held by cord passing around each leg; free end of lashing cord passes up from last leg and then around circumference of drum (6), making transverse turn around each oblique lashing; circumferential lashing finished off with overhand knots around last oblique lashing (7). The shark skin for this drum was cut too small and the turned-up circumference has been caught around first binder (2) with sewing of cotton thread. An alternate method of lashing skin to drum is to pass sennit lashing directly through holes in circumference of skin, passing lashing around legs as before; this method obviates the rather clumsy use of two circular wooden binders.

1:Beaglehole and Beaglehole E-5 (1934-5) 1938 Pukapukans

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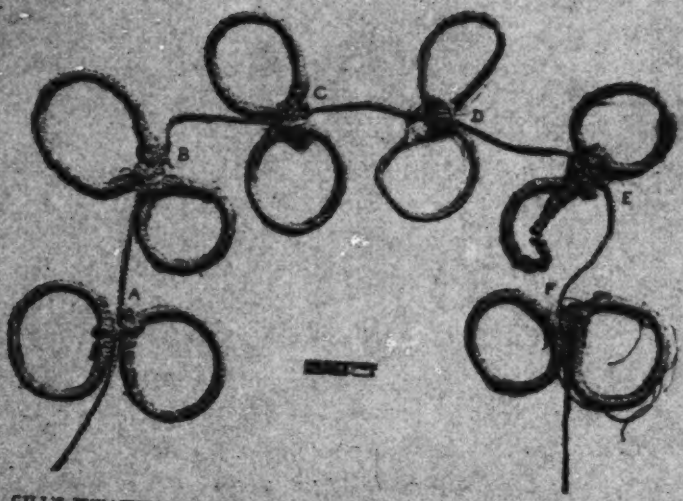

GILL'S PUKAPUKAN SOUL TRAP. DIMENSIONS: END TO A, 12 FEET 1½ INCHES; A TO B, 6½ INCHES; B TO C, 7¼ INCHES; C TO D, 6½ INCHES; D TO E, 7 INCHES; E TO F, 8 INCHES; F TO END, 4 FEET 3½ INCHES; APPROXIMATE DIAMETERS OF CIRCLES VARY FROM 4 INCHES TO 5 INCHES.

2: Macgregor E-2 (1933) 1935 Pukapukans
501, 322, 284

[Information in this source which is either inadequate, incorrect or duplication has only been filed in category 116: for description of canoes, their construction and lashings, see pp. 34-42.]